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Special Flood Hazard Evaluation Report

Lone Oak Ditch
Village of Whitehouse, Lucas County, Ohio

Prepared for the
Ohio Department of Natural Resources

US Army Corps
of Engineers
Buffalo District

November 1992

UNCLASSIFIED

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This technical report documents the result of an investigation to determine the potential flood situation along Lone Oak Ditch within the Village of Whitehouse, Ohio. The study reach includes Lone Oak Ditch from Whitehouse-Spencer Road, upstream to Archibold-Whitehouse Road. This report identifies the 100-year and 500-year flood plains and 100-year floodway for the 1.0 mile reach of Lone Oak Ditch within the Village of Whitehouse.

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SPECIAL FLOOD HAZARD EVALUATION REPORT
LONE OAK DITCH
VILLAGE OF WHITEHOUSE
LUCAS COUNTY, OHIO

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INTRODUCTION

This Special Flood Hazard Evaluation Report documents the results of an investigation to determine the potential flood situation along Lone Oak Ditch within the village of Whitehouse, Ohio. This study was conducted at the request of the Ohio Department of Natural Resources under the authority of Section 206 of the 1960 Flood Control Act, as amended. The study reach includes Lone Oak Ditch from Whitehouse-Spencer Road, upstream to the Archibold-Whitehouse Road.

The village of Whitehouse is located in Lucas County in northwestern Ohio, approximately 15 miles southwest of Toledo. It is surrounded by the unincorporated areas of Lucas County. The Village has a population of 2,240 according to the 1990 census (Reference 1).

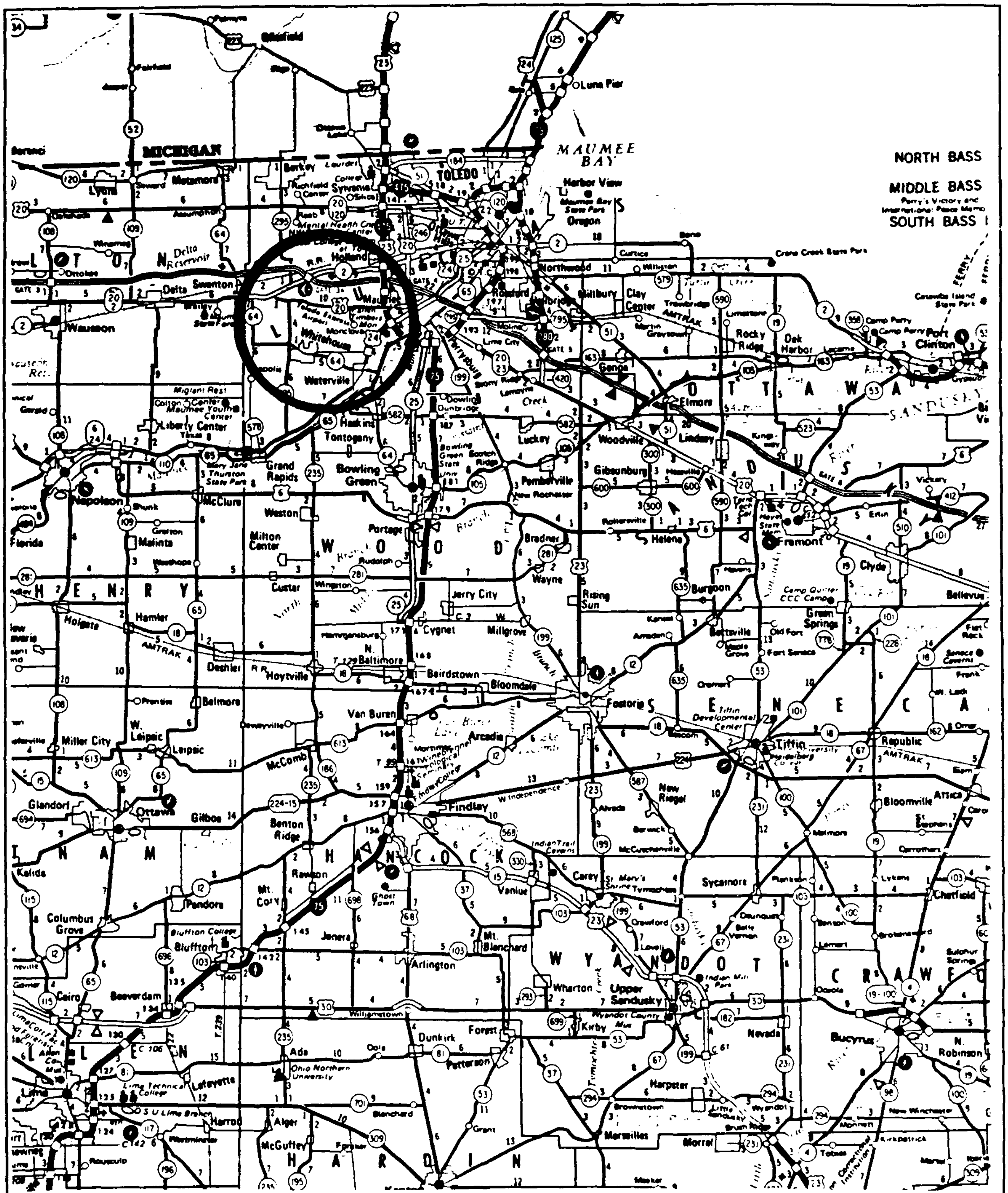
The climate of Whitehouse is classified as humid continental with short periods of extreme cold and heat. The temperatures range from a high of 101 degrees Fahrenheit (F.) to a low of -17 degrees Fahrenheit with a mean high temperature of 72.3 degrees Fahrenheit in the summer and a mean winter low of 24.8 degrees Fahrenheit. The average annual precipitation is approximately 31.51 inches (Reference 2).

The topography of Whitehouse is nearly flat with a gentle downward slope from west to east.

Lone Oak Ditch originates in Providence Township and flows in a northeasterly direction through the village of Whitehouse to its confluence with Swan Creek.

Knowledge of potential floods and flood hazards is important in land use planning. This report identifies the 100-year and 500-year flood plains and 100-year floodway for the 1.0-mile reach of Lone Oak Ditch within the village of Whitehouse.

Information developed for this study will be used by local officials to manage future flood plain development. While the report does not provide solutions to flood problems, it does furnish a suitable basis for the adoption of land use controls to guide flood plain development, thereby preventing intensification of the flood loss problem. It will also aid in the development of other flood damage reduction techniques to modify flooding and reduce flood damages which might be embodied in an overall Flood Plain Management (FPM) program. Other types of studies, such as those of environmental attributes and the current and future land use roles of the flood plain as part of its surroundings, would also profit from this information.



VILLAGE OF WHITEHOUSE, OHIO
(Lucas County)

SCALE

0 5 10 15 20

Miles

VICINITY MAP

Although Flood Insurance Rate Maps have been developed for the community, detailed analyses were not used to study the stream reaches analyzed in this study because the area was thought to have a low development potential at the time the maps were prepared. However, the area is now experiencing residential development pressure, and local officials requested detailed flood plain information to manage development.

Additional copies of this report can be obtained from the Ohio Department of Natural Resources until its supply is exhausted, and the National Technical Information Service of the U.S. Department of Commerce, Springfield, Virginia 22161, at the cost of reproducing the report. The Buffalo District Corps of Engineers will provide technical assistance and guidance to planning agencies in the interpretation and use of the hydrologic data obtained for this study.

PRINCIPAL FLOOD PROBLEMS

The principal flood problem has been where urbanization has occurred in the flood plain and culverts and bridges are undersized which leads to stream flow backups. Some flooding is a result of backwater from Swan Creek. The backwater conditions can extend long distances upstream due to flat stream gradients.

Flood Magnitudes and Their Frequencies

Floods are classified on the basis of their frequency or recurrence interval. A 100-year flood is an event with a magnitude that can be expected to be equaled or exceeded once on the average during any 100-year period. It has a 1.0 percent chance of occurring in any given year. It is important to note that, while on a long-term basis, the exceedence averages out to once per 100 years, floods of this magnitude can occur in any given year or even in consecutive years and within any given time interval. For example, there is a greater than 50 percent probability that a 100-year event will occur during a 70-year lifetime. Additionally, a house which is built within the 100-year flood level has about a one-in-four chance of being flooded in a 30-year mortgage life.

Hazards and Damages of Large Floods

The extent of damage caused by any flood depends on the topography of the flooded area, the depth and duration of flooding, the velocity of flow, the rate of rise in water surface elevation, and development of the flood plain. Deep water flowing at a high velocity and carrying floating debris would create conditions hazardous to persons and vehicles which attempt to cross the flood plain. Generally, water 3 or more feet deep which flows at a velocity of 3 or more feet per second could easily sweep an adult off his feet and create definite danger of injury or drowning. As indicated in Table 2, flow velocities of the stream studied exceed 3 feet per second in the upstream reach of Lone Oak Ditch. Rapidly rising and swiftly flowing floodwater

may trap persons in homes that are ultimately destroyed or in vehicles that are ultimately submerged or floated. Since water lines can be ruptured by deposits of debris and by the force of flood waters, there is the possibility of contaminated domestic water supplies. Damaged sanitary sewer lines and sewage treatment plants could result in the pollution of floodwaters and could create health hazards. Isolation of areas by floodwater could create hazards in terms of medical, fire, or law enforcement emergencies.

HYDROLOGIC ANALYSES

Hydrologic analyses were carried out to determine the peak discharge-frequency relationships for each flooding source affecting the community.

For this study, Lone Oak Ditch was divided into three hydrologic reaches. Reach 1 extends from the confluence with Swan Creek upstream to the confluence with Von Au Ditch which is approximately 300 feet upstream of Whitehouse-Spencer Road. Reach 2 extends from the Von Au Ditch confluence, upstream to a unnamed tributary which is located approximately 1500 feet downstream of Archibold-Whitehouse Road. Reach 3 extends from the unnamed tributary, upstream to Archibold-Whitehouse Road. For Reach 1, the discharges were calculated at the downstream corporate limit of the village. For Reaches 2 and 3, the discharges were calculated at the downstream point of each reach.

The method used to determine the 100-year and 500-year discharges was the Graphical Peak Discharge Method of the U.S. Soil Conservation Service (Reference 3). Watershed characteristics were determined through the use of U.S.G.S. 7.5 minute topographic maps (Reference 4), the guidelines in the National Handbook of Recommended Methods for Water Data Acquisition (Reference 5), and the cross sectional information obtained during field surveys. Soil types were determined by the use of Lucas County Soil Maps. The values for the drainage areas and 100-year and 500-year peak discharges are shown in Table 1.

Table 1 - Summary of Discharges

Location	Drainage Area (sq. mi.)	Peak Discharges (cfs) 100-Yr	500-Yr
Lone Oak Ditch			
at downstream corporate limit	2.30	600	790
approximately 300 feet upstream of Whitehouse-Spencer Road	1.31	400	530
approximately 1500 feet downstream of Archibold-Whitehouse Road	0.58	230	300

HYDRAULIC ANALYSES

Analyses of the hydraulic characteristics of flooding from sources studied were carried out to provide estimates of the elevations of floods for the 100-year and 500-year recurrence intervals.

Cross-section data for the backwater analyses of the Lone Oak Ditch were obtained from field surveys performed by Buffalo District personnel in December 1991. Additional data were obtained from topographic maps (References 4 and 6). All bridges and culverts were surveyed to determine elevation data and structural geometry. Spot elevations were obtained in the overbank areas in order to accurately delineate the flood plain boundaries.

Water surface elevations of the 100-year and 500-year recurrence interval flood events were computed using the COE HEC-2 step-backwater computer program (Reference 7). The starting water surface elevation for Lone Oak Ditch was determined using the slope area method.

Locations of the selected cross-sections used in the hydraulic analyses are shown on the Flood Profile (Plate 1) and on the Flooded Area Map which accompanies this report.

Channel and overbank roughness factors (Manning's "n") used in the hydraulic computations were selected using engineering judgement and were based on field observations of the stream and flood plain areas. The values for Mannings "n" ranged from 0.030 to 0.035 in the channel and 0.035 to 0.060 in the overbank areas. The contraction and expansion coefficients used were 0.3 and 0.5, respectively.

Flood profiles were drawn showing the computed water surface elevations for the selected recurrence intervals. The flood plain boundaries were delineated using the flood elevations determined at each cross section. Between cross sections, the boundaries were interpolated using the topographic maps and spot elevations obtained during the field surveys. Small areas within the flood plain boundaries may be above the flood elevations, but cannot be shown due to limitations of the map scale and/or lack of detailed topographic data.

Floodways were determined for the streams studied in detail. Floodway encroachments were based on equal conveyance reduction from each side of the flood plain. At the request of the Ohio Department of Natural Resources, the maximum increase in stage due to encroachment was limited to 1 foot provided that hazardous velocities were not produced. Floodway widths were computed at cross sections and varied from 33 to 100 feet on Lone Oak Ditch. Between cross sections, the floodway boundaries were interpolated. The results of the floodway computations are tabulated for selected cross sections and are shown in Table 2.

FLOODING SOURCE		FLOODWAY			BASE FLOOD WATER SURFACE ELEVATION			
CROSS SECTION	DISTANCE[1]	WIDTH (FEET)	SECTION AREA (SQUARE FEET)	MEAN VELOCITY (FEET PER SECOND)	REGULATORY	WITHOUT FLOODWAY (FEET NGVD)	WITH FLOODWAY (FEET NGVD)	INCREASE
A	1,650	72	281	2.1	648.3	648.3	648.3	0.0
B	1,945	33	152	2.6	648.3	648.3	648.3	0.0
C	3,465	70	309	1.3	653.0	653.0	653.0	0.0
D	4,210	60	236	1.7	653.1	653.1	653.1	0.0
E	5,350	100	232	1.0	653.1	653.1	653.2	0.1
F	6,355	100	51	4.5	653.1	653.1	653.6	0.5

1 Distance is measured in feet upstream from corporate limit.

VILLAGE OF WHITEHOUSE, OHIO
(LUCAS COUNTY)

FLOODWAY DATA

LONE OAK DITCH

TABLE 2

The computed floodways are also shown on the Flooded Area Map. In cases where the floodway and the 100-year flood plain boundaries are either close together or collinear, only the floodway boundary is shown.

The hydraulic analyses for this study were based on unobstructed flow. The flood elevations shown on the profile are considered valid only if hydraulic structures remain unobstructed, operate properly, and do not fail.

All elevations are referenced to the National Geodetic Vertical Datum of 1929 (NGVD). Descriptions of the marks are presented in Table 3.

Table 3 - Elevation Reference Marks

Reference Mark	Elevation (feet NGVD)	Description of Location
RM 1	651.76	Southmost bolt of fire hydrant located at end of Disher Avenue.
RM 2	651.82	Top of downstream culvert located on Centerville Road at Lone Oak Ditch.
RM 3	649.71	Top of downstream face of culvert located on Oakbrook Drive at Lone Oak Ditch.
RM 4	651.95	Downstream right corner of concrete headwall (painted yellow) of culvert located on Archibold-Whitehouse Road at Lone Oak Ditch.
RM 5	644.78	Chiseled square on top of downstream end of pipe culvert located on Whitehouse-Spencer Road at Lone Oak Ditch.

UNIFIED FLOOD PLAIN MANAGEMENT

Historically, the alleviation of flood damage has been accomplished almost exclusively by the construction of protective works such as reservoirs, channel improvements, and floodwalls and levees. However, in spite of the billions of dollars that have already been spent for construction of well-designed and efficient flood control works, annual flood damages continue to increase because the number of persons and structures occupying floodprone lands is increasing faster than protective works can be provided.

Recognition of this trend has forced a reassessment of the flood control concept and resulted in the broadened concept of unified flood plain management programs. Legislative and administrative policies frequently cite two approaches: structural and nonstructural, for adjusting to the flood hazard. In this context, "structural" is usually intended to mean adjustments that modify the behavior of floodwaters through the use of measures such as dams and channel work. "Nonstructural" is usually intended to include all other adjustments in the way society acts when occupying or modifying a flood plain (e.g., regulations, floodproofing, insurance, etc.). Both structural and nonstructural tools are used for achieving desired future flood plain conditions. There are three basic strategies which may be applied individually or in combination: (1) modifying the susceptibility to flood damage and disruption, (2) modifying the floods themselves, and (3) modifying (reducing) the adverse impacts of floods on the individual and the community.

Modify Susceptibility to Flood Damage and Disruption

The strategy to modify susceptibility to flood damage and disruption consists of actions to avoid dangerous, economically undesirable, or unwise use of the flood plain. Responsibility for implementing such actions rests largely with the non-Federal sector and primarily at the local level of government.

These actions include restrictions in the mode and the time of occupancy; in the ways and means of access; in the pattern, density, and elevation of structures and in the character of their materials (structural strength, absorptiveness, solubility, corrodibility); in the shape and type of buildings and in their contents; and in the appurtenant facilities and landscaping of the grounds. The strategy may also necessitate changes in the interdependencies between flood plains and surrounding areas not subject to flooding, especially interdependencies regarding utilities and commerce. Implementing mechanisms for these actions include land use regulations, development and redevelopment policies, floodproofing, disaster preparedness and response plans, and flood forecasting and warning systems.

Different tools may be more suitable for developed or underdeveloped flood plains or for urban or rural areas. The information contained in this report is particularly useful for the preparation of flood plain regulations.

a. Flood Plain Regulations.

Flood plain regulations apply to the full range of ordinances and other means designed to control land use and construction within floodprone areas. The term encompasses zoning ordinances, subdivision regulations, building and housing codes, encroachment line statutes, open area regulations, and other similar methods of management which affect the use and development of floodprone areas.

Flood plain land use management does not prohibit use of floodprone areas; to the contrary, flood plain land use management seeks the best use of flood plain lands. The flooded area map and the water surface profile contained in this report can be used to guide development in the flood plain. The elevations shown on the profile should be used to determine flood heights because they are more accurate than the outlines of flooded areas. It is recommended that development in areas susceptible to frequent flooding adhere to the principles expressed in Executive Order 11988 - Flood Plain Management, whose objective is to ". . . avoid to the extent possible the long- and short-term adverse impacts associated with the occupancy and modification of flood plains . . . whenever there is a practicable alternative." Accordingly, development in areas susceptible to frequent flooding should consist of construction which has a low damage potential such as parking areas, parks, and golf courses. High value construction such as buildings, should be located outside the flood plain to the fullest extent possible. In instances where no practicable alternative exists, the land should be elevated to minimize damages. If it is uneconomical to elevate the land in these areas, means of floodproofing the structure should be given careful consideration.

b. Development Zones.

A flood plain consists of two zones. The first zone is the designated "floodway" or that cross sectional area required for carrying or discharging the anticipated flood waters with a maximum 1-foot increase in flood level (Ohio Department of Natural Resources standard). Velocities are the greatest and most damaging in the floodway. Regulations essentially maintain the flow-conveying capability of the floodway to minimize inundation of additional adjacent areas. Uses which are acceptable for floodways include parks, parking areas, open spaces, etc.

The second zone of the flood plain is termed the "floodway fringe" or restrictive zone, in which inundation might occur but where depths and velocities are generally low. Although not recommended if practicable alternatives exist, such areas can be developed provided structures are placed high enough or floodproofed to be reasonably free from flood damage during the 100-year flood. Typical relationships between the floodway and floodway fringe are shown in Figure 2. The floodway for Lone Oak Ditch has been plotted on the Flooded Area Map.

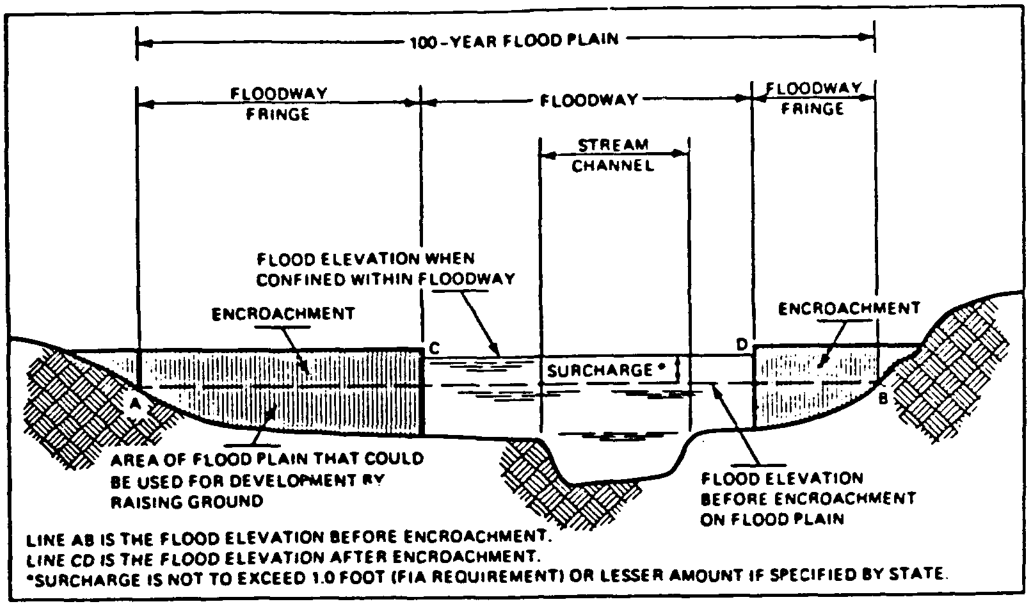


Figure 2 - Floodway Schematic

c. Formulation of Flood Plain Regulations.

Formulation of flood plain regulations in a simplified sense involves selecting the type and degree of control to be exercised for each specific flood plain. In principle, the form of the regulations is not as important as a maintained adequacy of control. The degree of control normally varies with the flood hazard as measured by depth of inundation, velocity of flow, frequency of flooding, and the need for available land. Considerable planning and research is required for the proper formulation of flood plain regulations. Formulation of flood plain regulations may require a lengthy period of time during which development is likely to occur. In such cases, temporary regulations should be adopted and amended later as necessary.

Modify Flooding

The traditional strategy of modifying floods through the construction of dams, dikes, levees and floodwalls, channel alterations, high flow diversions and spillways, and land treatment measures has repeatedly demonstrated its effectiveness for protecting property and saving lives, and it will continue to be a strategy of flood plain management. However, in the future, reliance solely upon a flood modification strategy is neither possible nor desirable. Although the large capital investment required by flood modifying tools has been provided largely by the Federal government, sufficient funds from Federal sources have not been and are not likely to be available to meet all situations for which flood modifying measures would be both effective and economically feasible. Another consideration is that the cost of maintaining and operating flood control structures falls upon local governments.

Flood modifications acting alone leave a residual flood loss potential and can encourage an unwarranted sense of security leading to inappropriate use of lands in the areas that are directly protected or in adjacent areas. For this reason, measures to modify possible floods should usually be accompanied by measures to modify the susceptibility to flood damage, particularly by land use regulations.

<u>Modify the Impact of Flooding on Individuals and the Community</u>

A third strategy for mitigating flood losses consists of actions designed to assist individuals and communities in their preparatory, survival, and recovery responses to floods. Tools include information dissemination and education, arrangements for spreading the costs of the loss over time, purposeful transfer of some of the individual's loss to the community by reducing taxes in flood prone areas, and the purchase of Federally subsidized flood insurance.

The distinction between a reasonable and unreasonable transfer of costs from the individual to the community can also be regulated and is a key to effective flood plain management.

CONCLUSION

This report presents local flood hazard information for Lone Oak Ditch in the Village of Whitehouse, Ohio. The U.S. Army Corps of Engineers, Buffalo District, will provide interpretation in the application of the data contained in this report, particularly as to its use in developing effective flood plain regulations. Requests should be coordinated with the Ohio Department of Natural Resources.

GLOSSARY

BACKWATER EFFECT	The resulting rise in water surface in a given stream due to a downstream obstruction or high stages in an intersecting stream.
BASE FLOOD	A flood which has an average return interval in the order of once in 100 years, although the flood may occur in any year. It is based on statistical analysis of streamflow records available for the watershed and analysis of rainfall and runoff characteristics in the general region of the watershed. It is commonly referred to as the "100-year flood."
DISCHARGE	The quantity of flow in a stream at any given time, usually measured in cubic feet per second (cfs).
FLOOD	An overflow of lands not normally covered by water. Floods have two essential characteristics: the inundation of land is temporary and the lands are adjacent to and inundated by overflow from a river, stream, ocean, lake, or other body of standing water. Normally a "flood" is considered as any temporary rise in streamflow or stage, but not the ponding of surface water, that results in significant adverse effects in the vicinity. Adverse effects may include damages from overflow of land areas, temporary backwater effects in sewers and local drainage channels, creation of unsanitary conditions or other unfavorable situations by deposition of materials in stream channels during flood recessions, and rise of groundwater coincident with increased streamflow.
FLOOD CREST	The maximum stage or elevation reached by floodwaters at a given location.
FLOOD FREQUENCY	A statistical expression of the percent chance of exceeding a discharge of a given magnitude in any given year. For example, a <u>100-year flood</u> has a magnitude expected to be exceeded on the average of once every hundred years. Such a <u>flood</u> has a 1 percent chance of being exceeded in any given year. Often used interchangeably with <u>RECURRENCE INTERVAL</u>.

FLOOD PLAIN	The areas adjoining a river, stream, watercourse, ocean, lake, or other body of standing water that have been or may be covered by floodwater.
FLOOD PROFILE	A graph showing the relationship of water surface elevation to location; the latter generally expressed as distance upstream from a known point along the approximate centerline of a stream of water that flows in an open channel. It is generally drawn to show surface elevation for the crest of a specific flood, but may be prepared for conditions at a given time or stage.
FLOOD STAGE	The stage or elevation at which overflow of the natural banks of a stream or body of water begins in the reach or area in which the elevation is measured.
FLOODWAY	The channel of a watercourse and those portions of the adjoining flood plain required to provide for the passage of the selected flood (normally the 100-year flood) with an insignificant increase in the flood levels above that of natural conditions. As used in the National Flood Insurance Program, floodways must be large enough to pass the 100-year flood without causing an increase in elevation of more than a specified amount (1 foot in most areas).
RECURRENCE INTERVAL	A statistical expression of the average time between floods exceeding a given magnitude (see FLOOD FREQUENCY).

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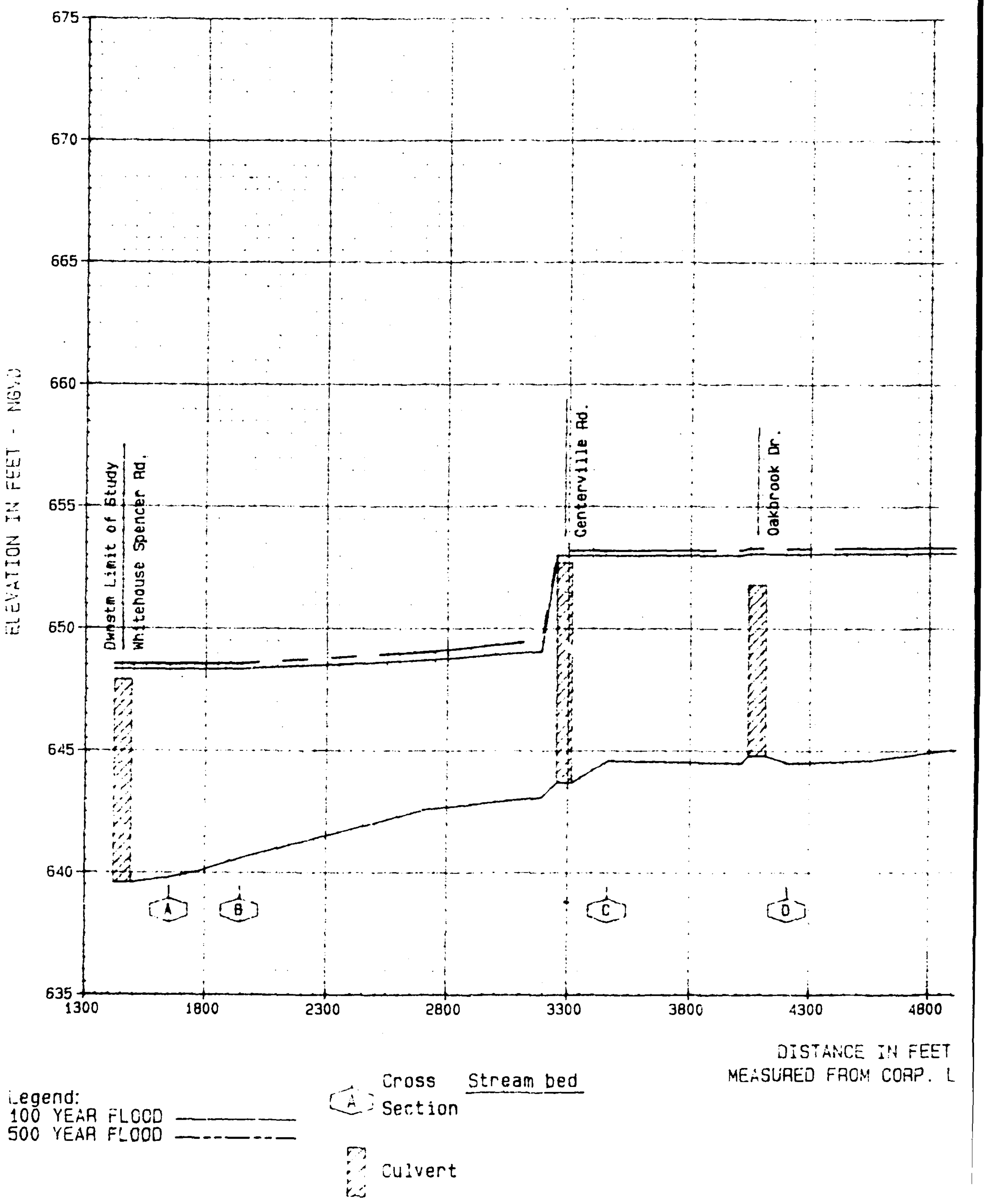

ELEVATION IN FEET - NGVD
675
670
665
660
655
650
645
640
635
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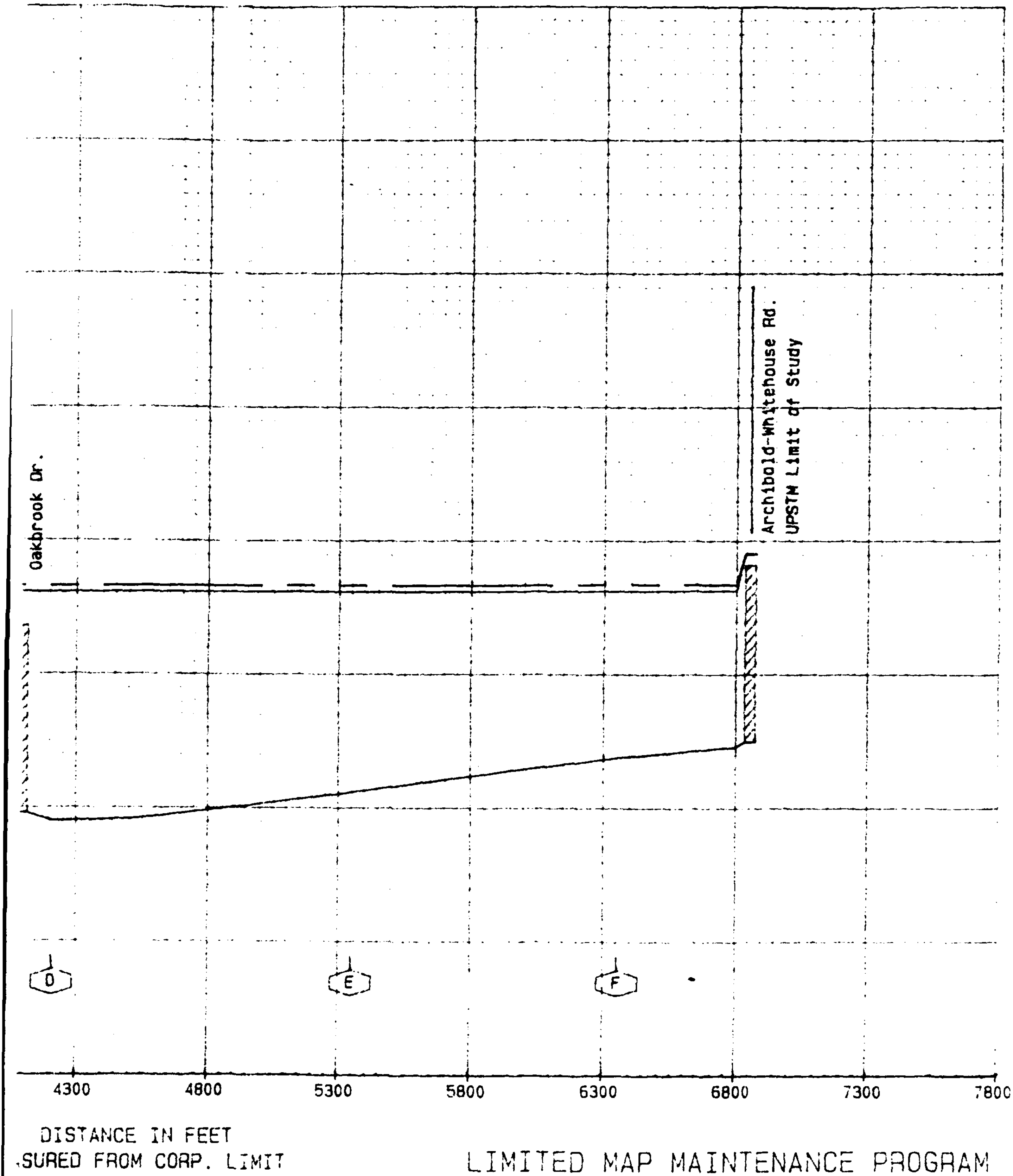
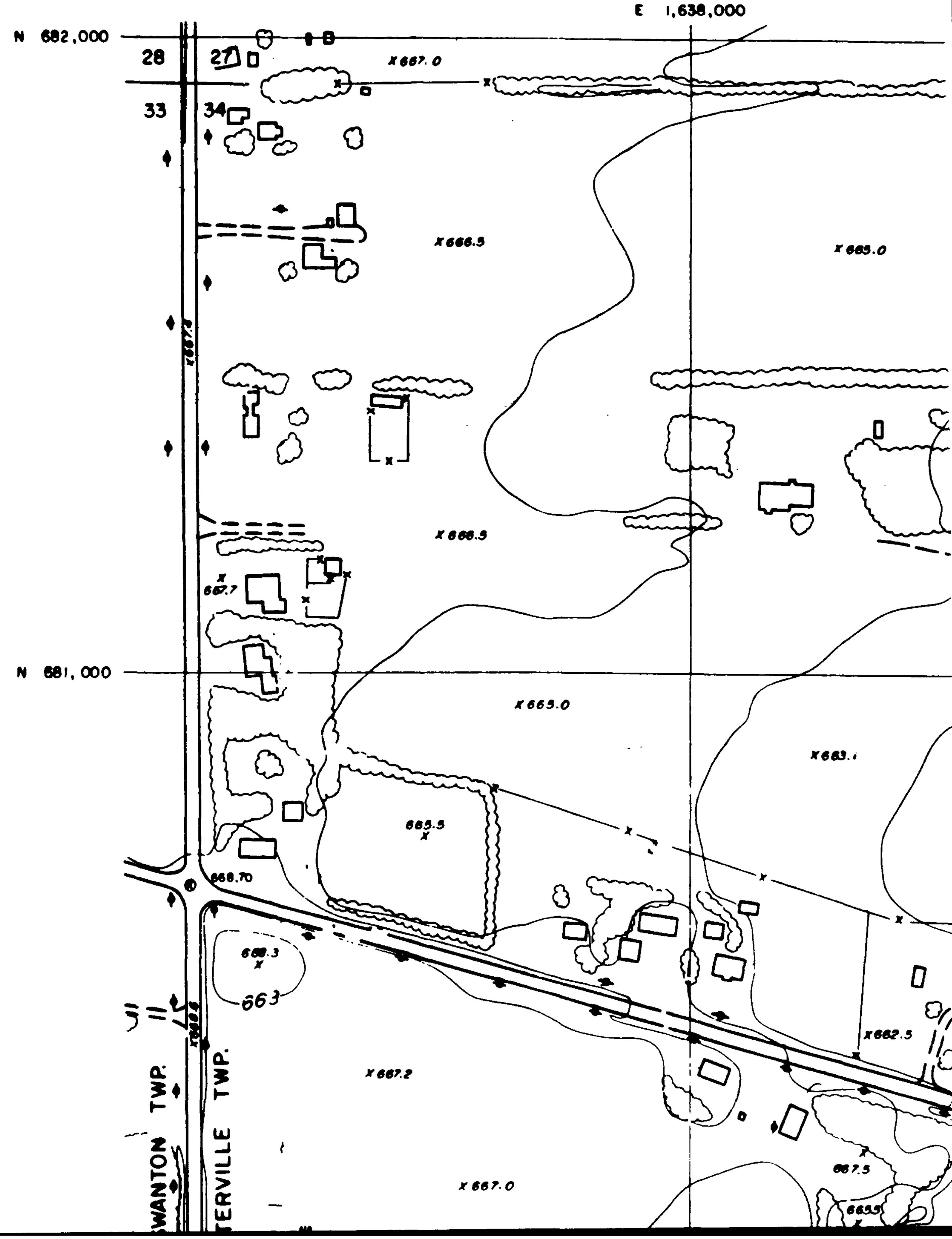
1800
2300
2800
3300
3800
4300
4800
Dwnstm Limit of Study
Whitehouse Spencer Rd.
Centerville Rd.
Oakbrook Dr.
A
B
C
D
DISTANCE IN FEET
MEASURED FROM CORP. L
Legend:
100 YEAR FLOOD
500 YEAR FLOOD
Cross Section
Stream bed
Culvert



LIMITED MAP MAINTENANCE PROGRAM
FLOOD PROFILE
LONEOAK DITCH
VILLAGE OF WHITEHOUSE
LUCAS CO. OHIO (Plate 1 of 1)

1



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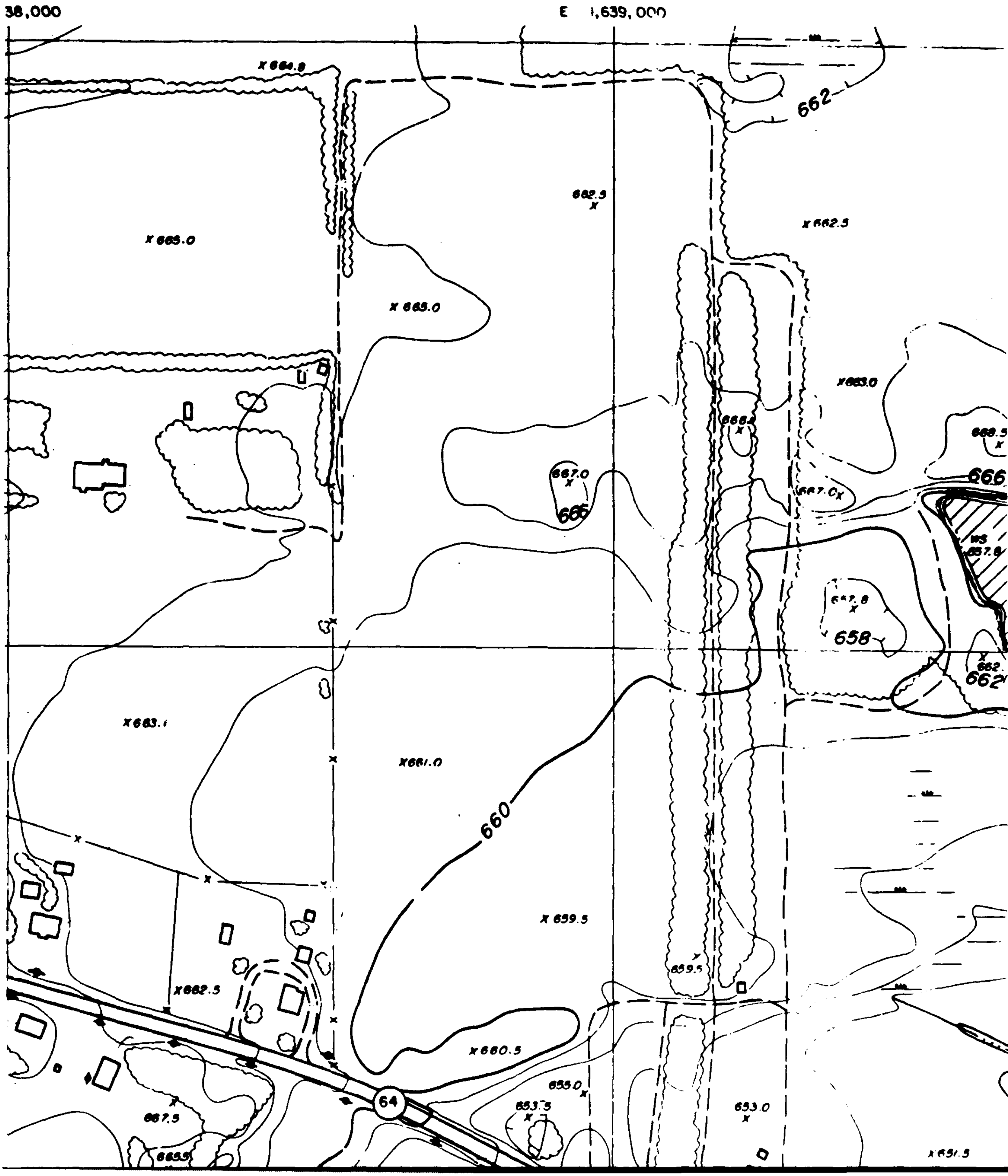
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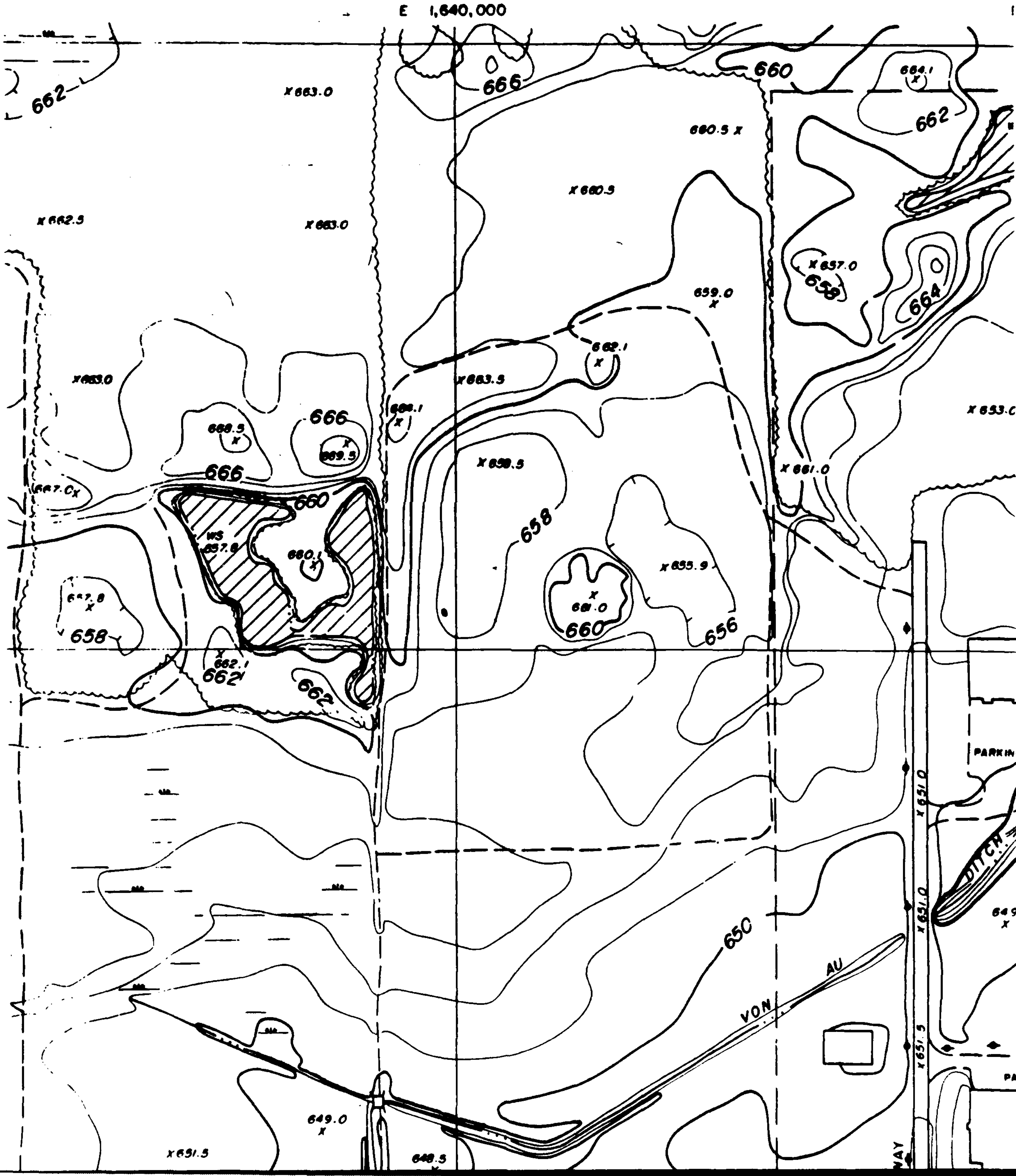

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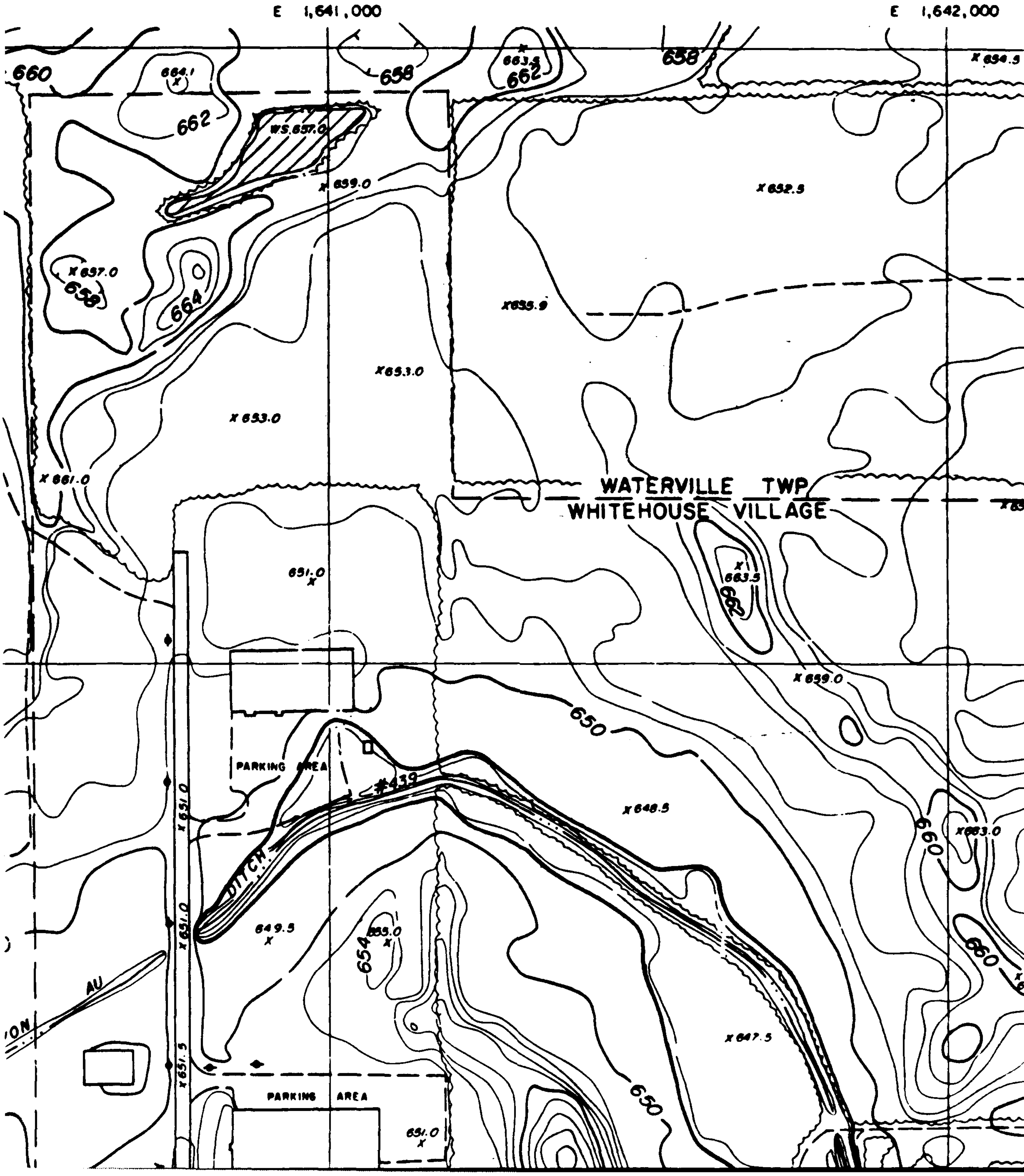

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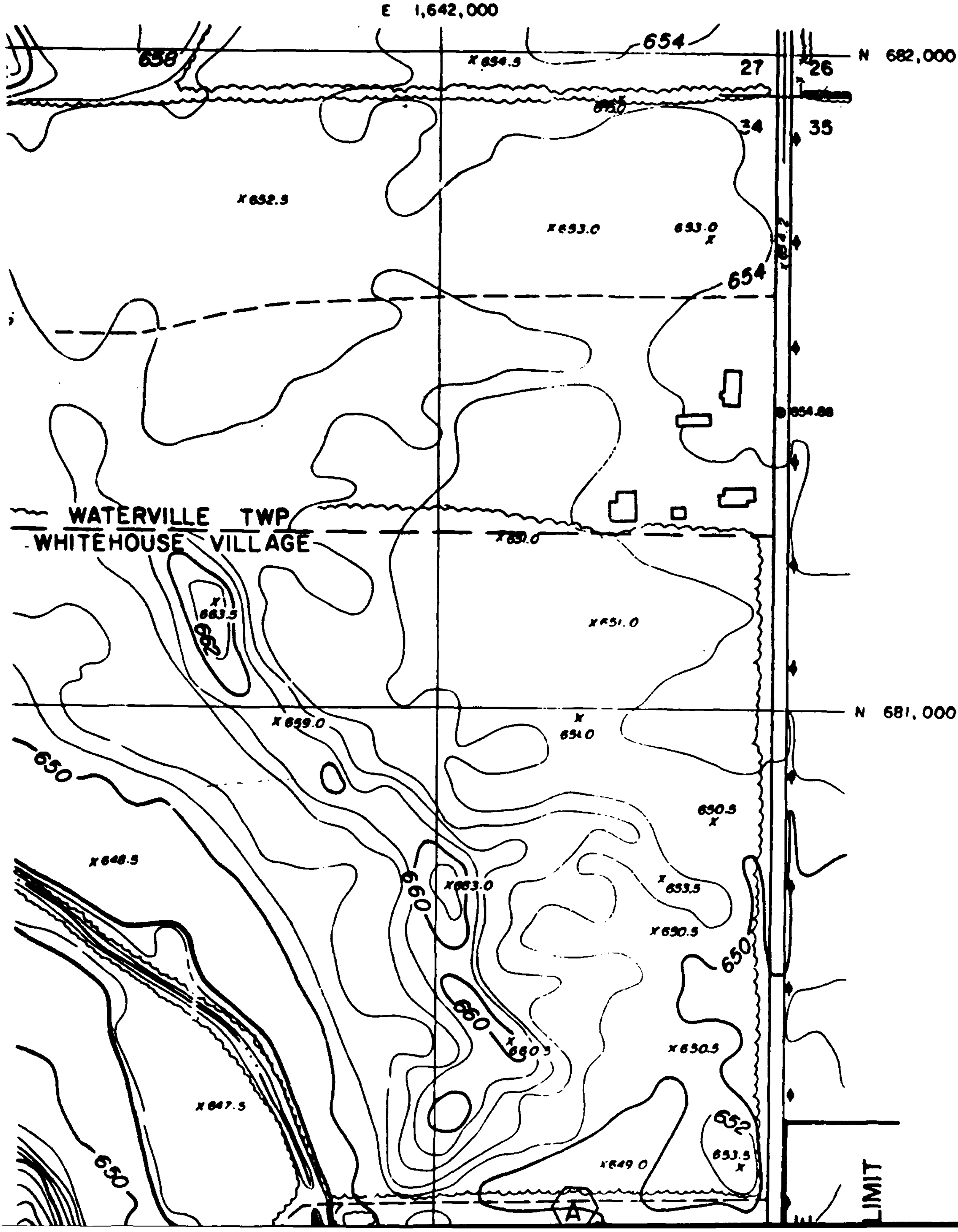

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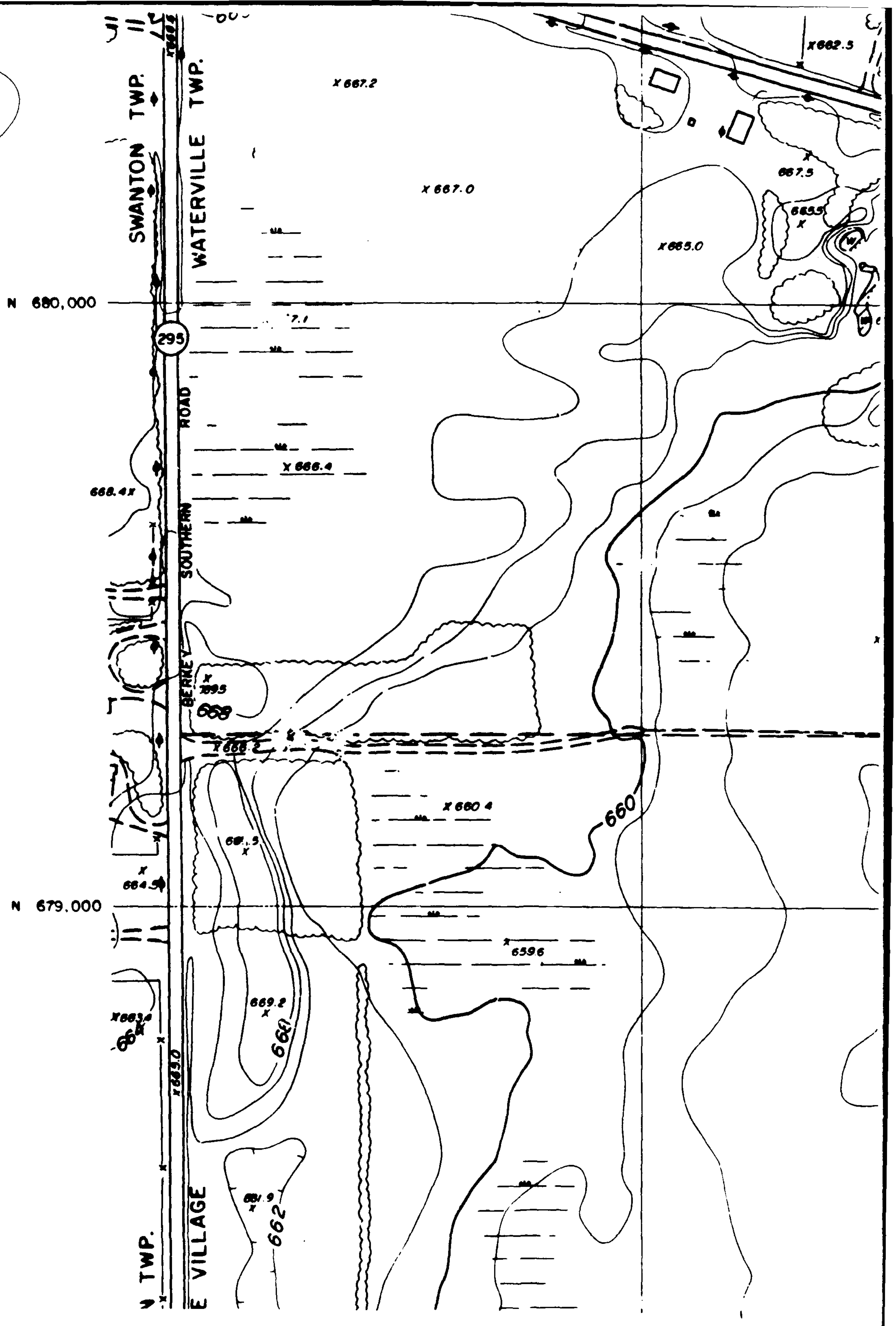
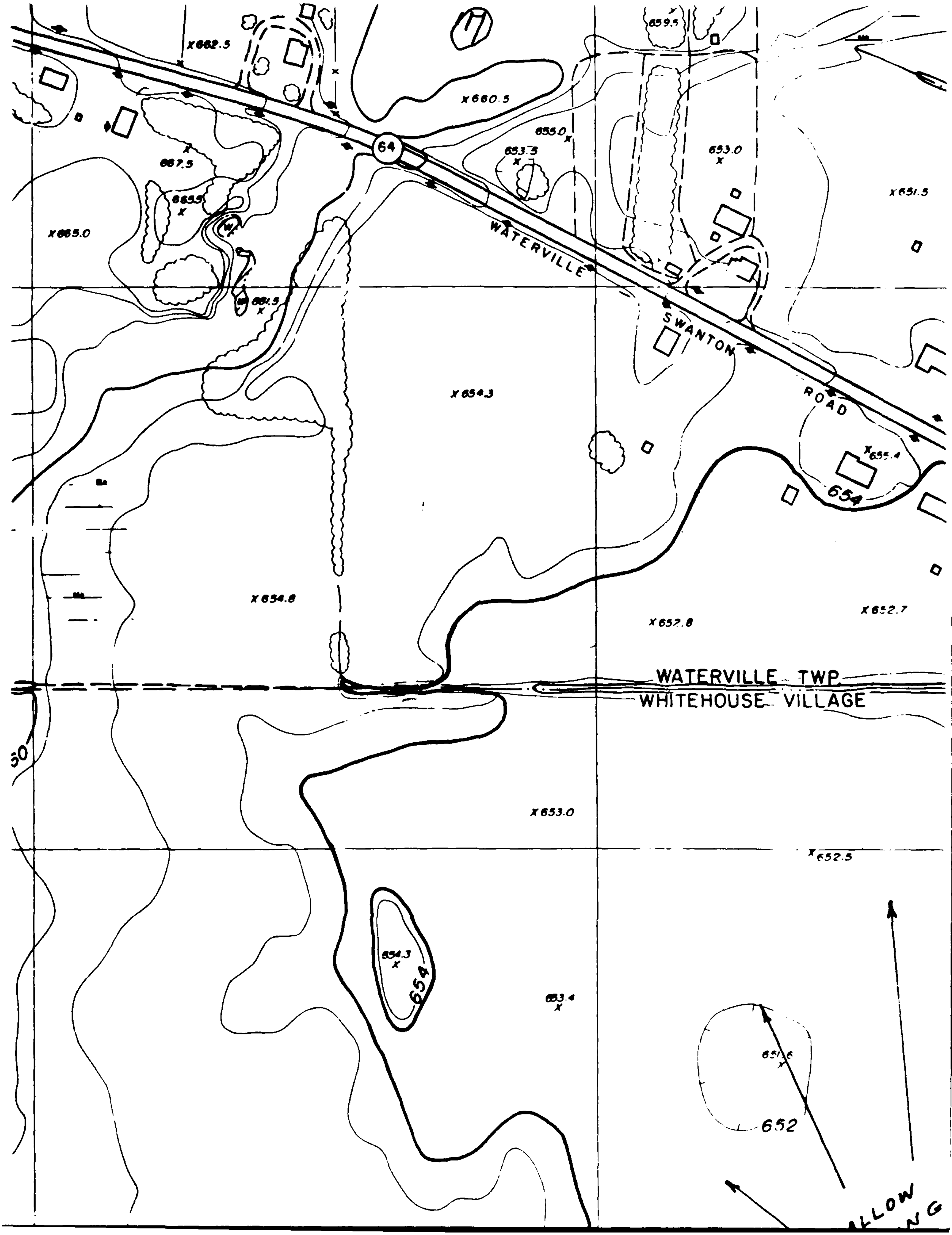
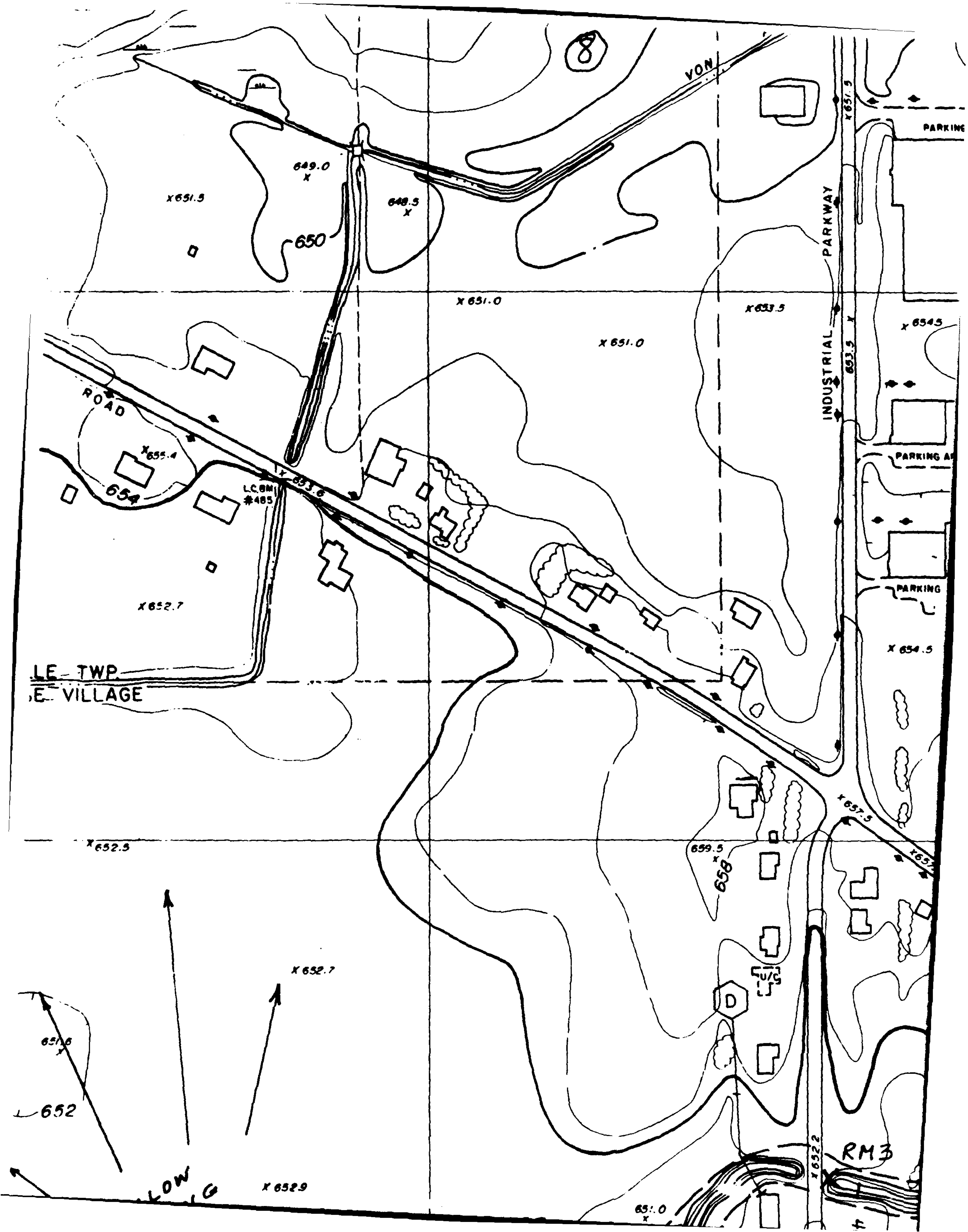
N 682,000
N 681,000
654
658
x 654.5
27
26
34
35
x 652.5
x 653.0
653.0
654
654.88
WATERVILLE TWP
WHITEHOUSE VILLAGE
x 651.0
663.5
662
x 659.0
654.0
650
x 648.5
650.5
660
x 663.0
653.5
x 650.5
650
660
660.5
x 650.5
x 647.5
652
650
653.5
x 649.0
A
LIMIT

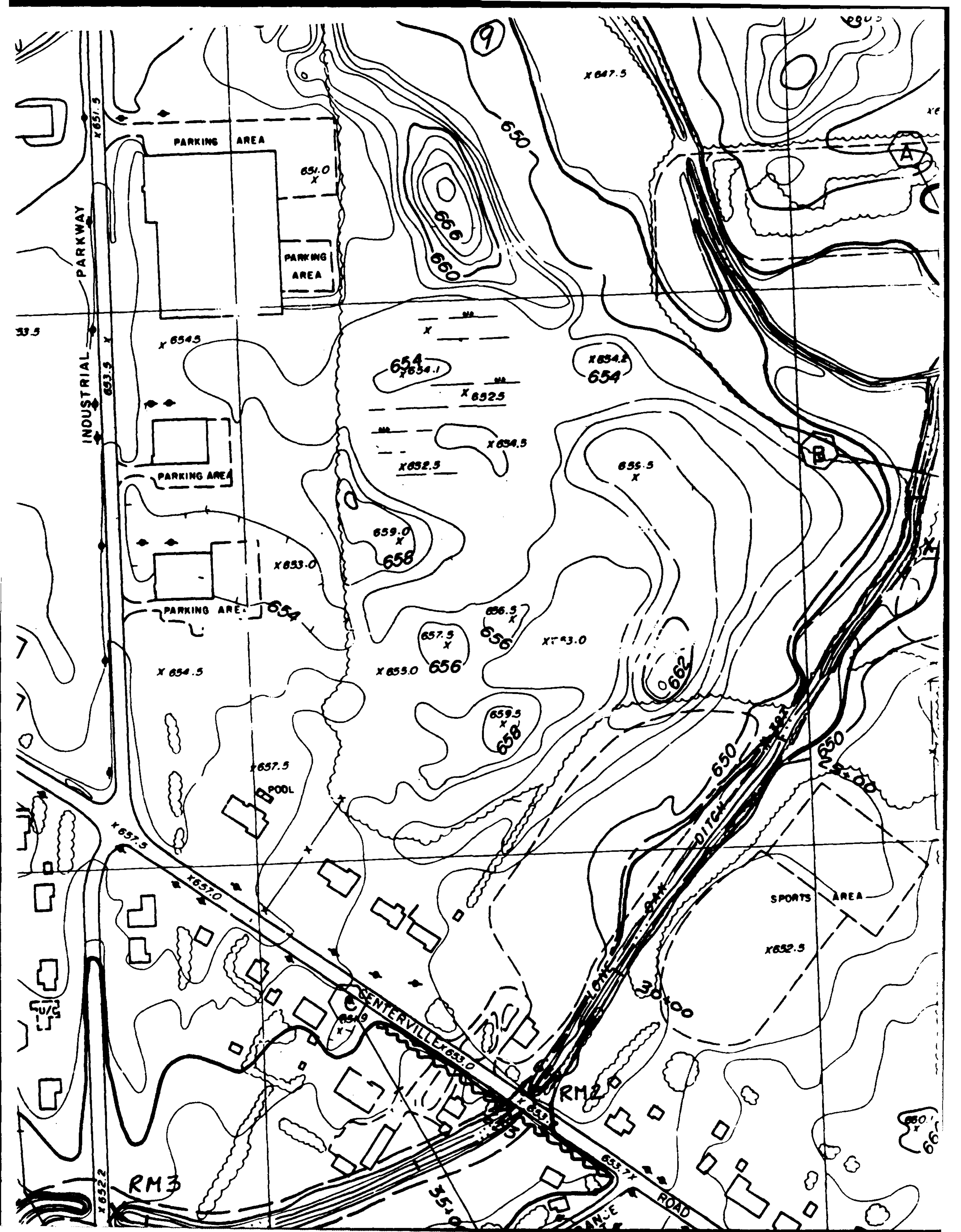
6



SWANTON TWP.
WATERVILLE TWP.
N 680,000
295
SOUTHERN
ROAD
BERKEY
N 679,000
TWP.
E VILLAGE
x 667.2
x 667.0
x 665.0
x 662.3
667.5
668.4 x
x 666.4
668
x 666.2
x 660.4
660
664.5
659.6
669.2
x 665.0
661.9
662

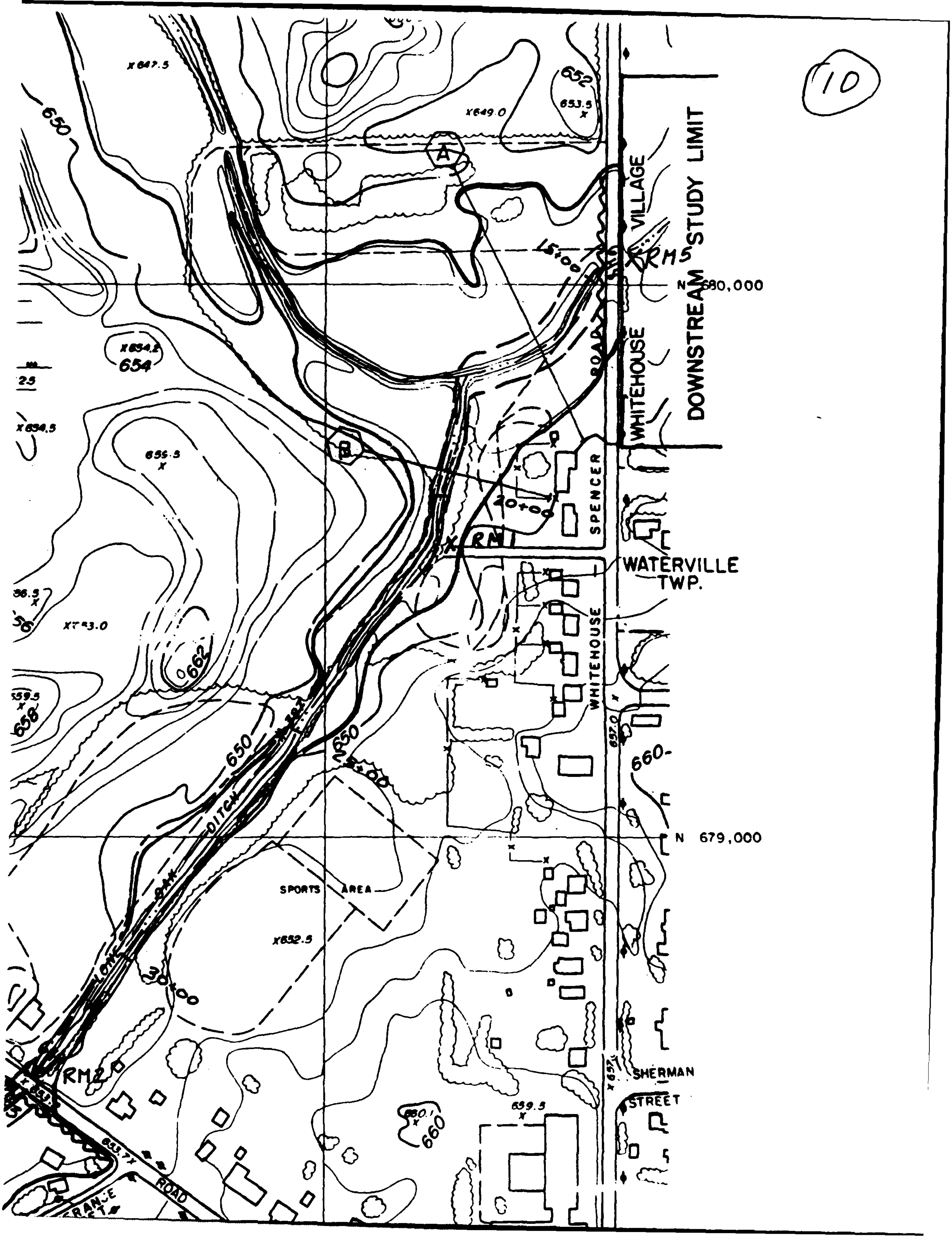

X 662.5
X 660.5
655.0
653.5
653.0
659.5
667.5
665.5
X 665.0
X 651.5
64
WATERVILLE
SWANTON
ROAD
661.5
X 654.3
655.4
654
X 654.8
X 652.8
X 652.7
WATERVILLE TWP.
WHITEHOUSE VILLAGE
X 653.0
652.5
654.3
654
653.4
651.6
652


8
VON
PARKING
649.0
651.5
648.5
650
PARKWAY
INDUSTRIAL
651.0
653.5
651.0
654.5
ROAD
655.4
654
LC BM
#485
653.6
PARKING
652.7
PARKING
654.5
LE TWP.
E VILLAGE
652.5
657.5
659.5
658
U/C
652.7
D
651.6
652
RM3
652.2
LOW
G
652.9
651.0



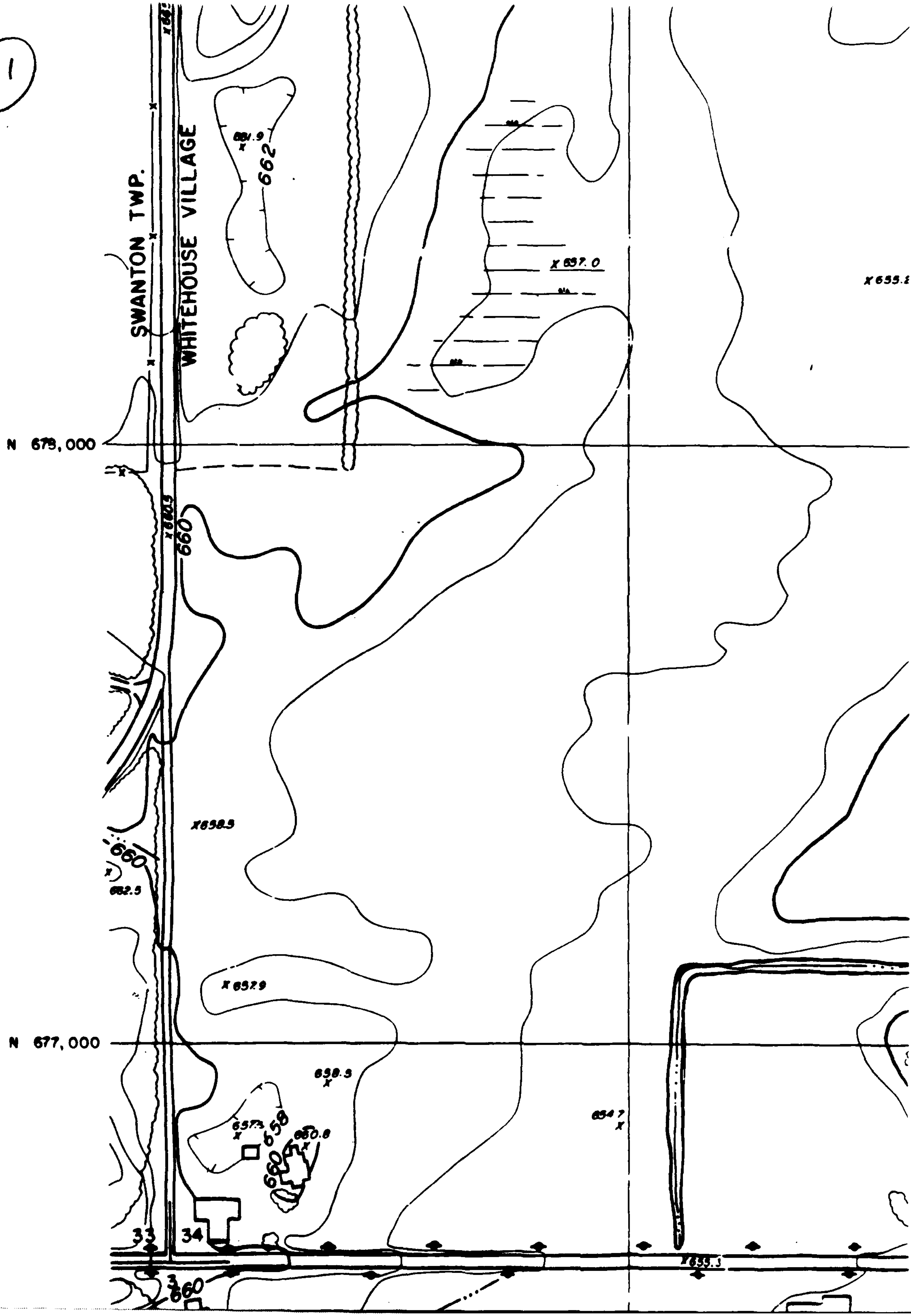
9
PARKING AREA
PARKING AREA
PARKING AREA
PARKING AREA
INDUSTRIAL PARKWAY
x 651.5
x 653.5
x 652.2
651.0 x
x 647.5
650
666
660
x 654.5
654
x 654.1
x 654.2
654
x 652.5
x 654.5
x 652.5
655.5 x
659.0 x
658
x 653.0
654
656.5 x
656
657.5 x
x 655.0
656
662
659.5 x
658
x 654.5
x 657.5
POOL
x 657.5
x 657.0
650
650
650
DITCH
OAK
LONG
SPORTS AREA
x 652.5
30+00
35+00
CENTERVILLE
x 653.0
ROAD
x 653
653.7 x
RM2
RM3
A
B
C

10

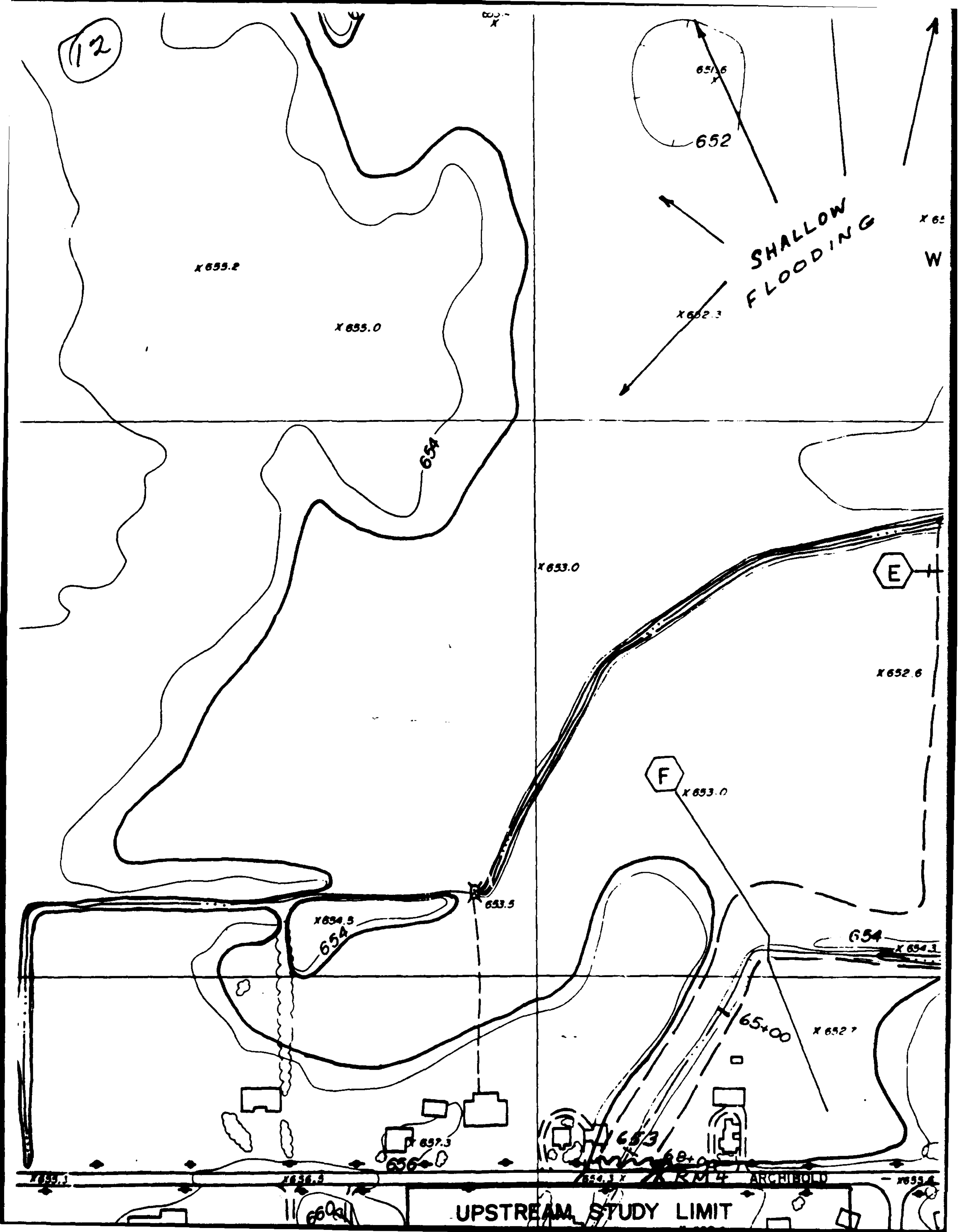


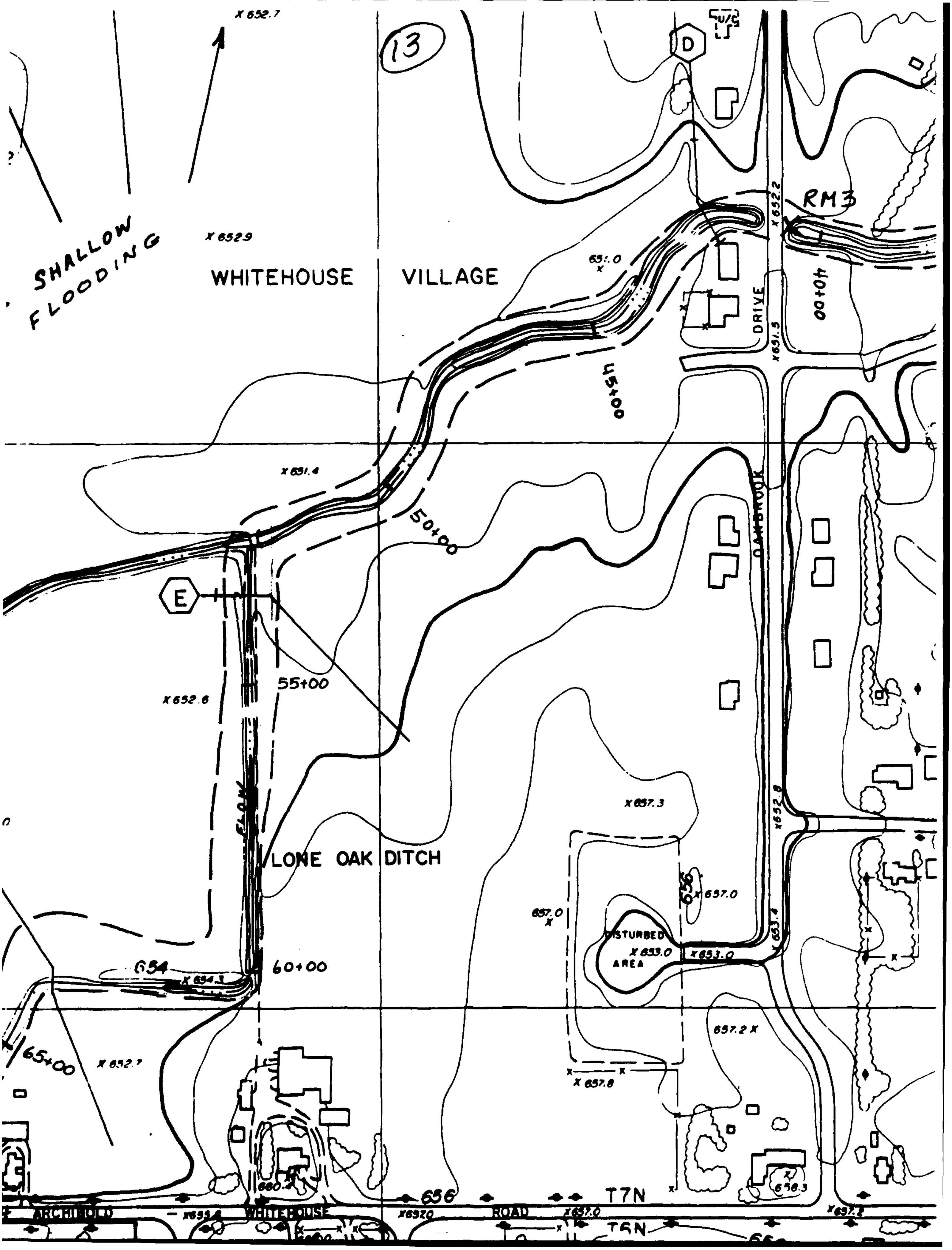
DOWNSTREAM STUDY LIMIT
VILLAGE
WHITEHOUSE
WATERVILLE TWP.
WHITEHOUSE
SPENCER ROAD
N 680,000
N 679,000
RM5
RM1
RM2
15+00
20+00
25+00
30+00
A
B
LONG OAK DITCH
SPORTS AREA
SHERMAN STREET
ROAD
650
652
654
658
660
662
X 647.5
X 649.0
653.5
X 654.2
X 654.5
655.5
X 653.0
X 652.5
659.5
660.1
657.0

(11)

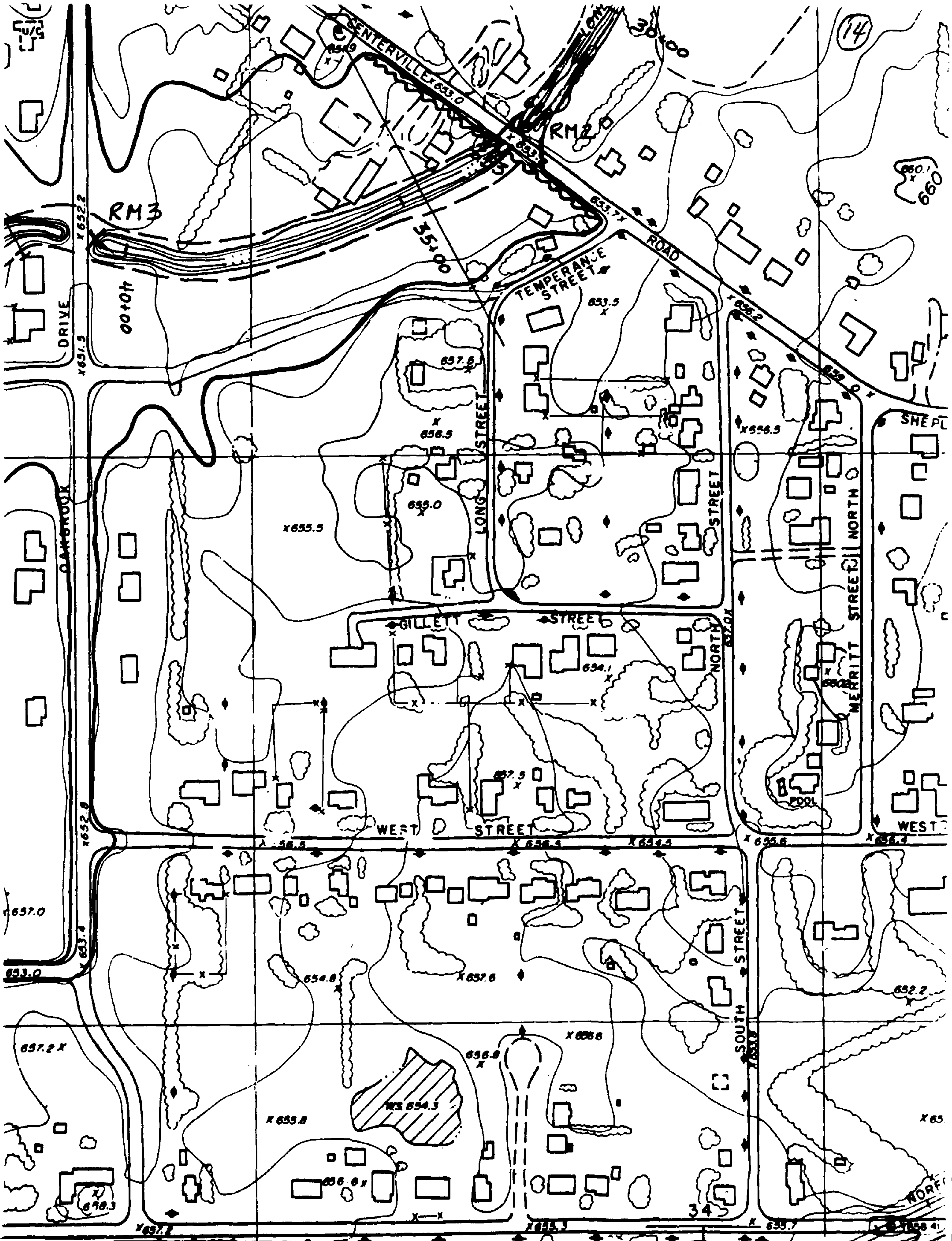


SWANTON TWP.
WHITEHOUSE VILLAGE
661.9
662
x 657.0
x 655.2
N 679,000
660
660.5
x 658.3
660
652.5
x 657.9
N 677,000
658.3
657.3
658
660.8
660
654.7
33
34
3
660
x 655.3

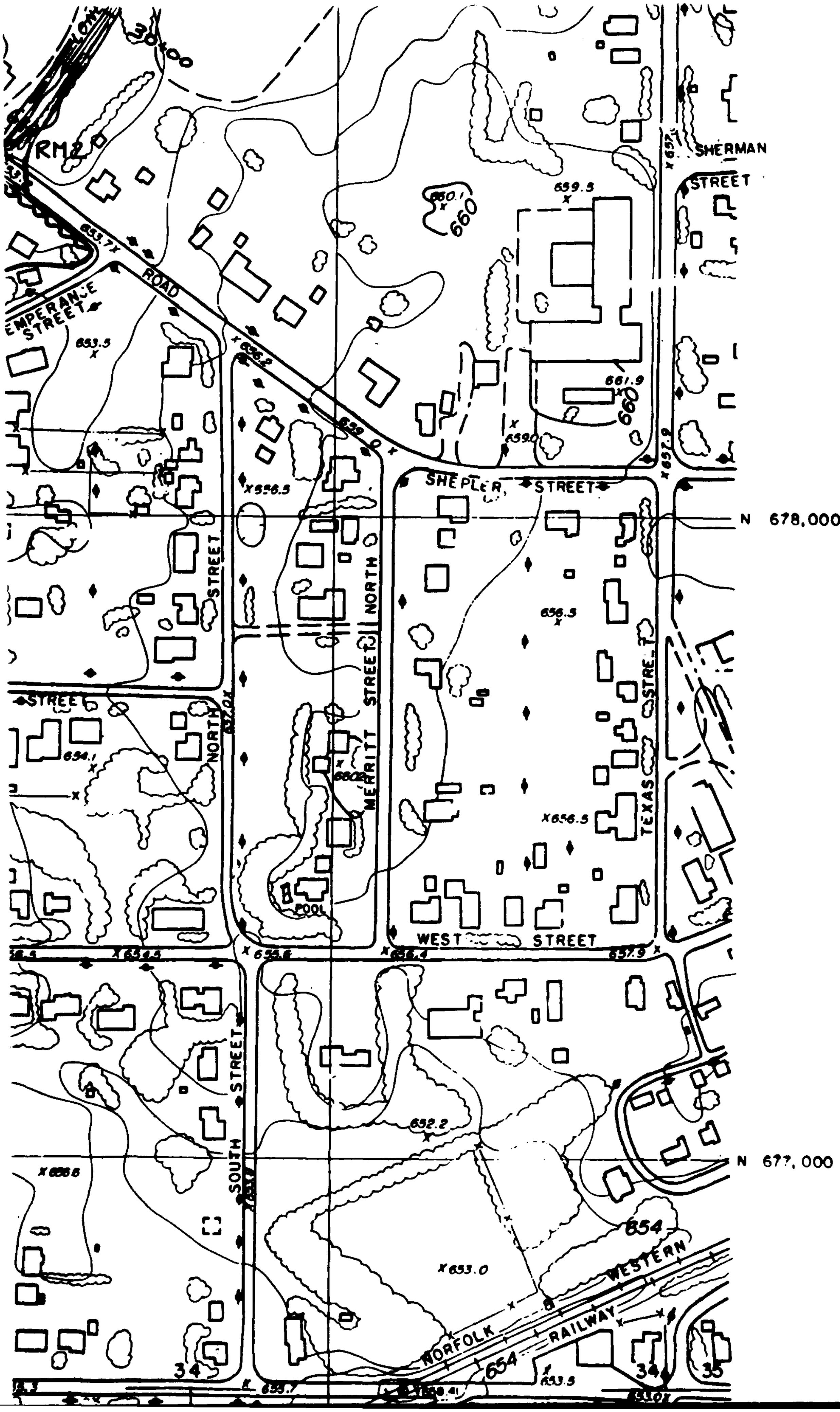

12
652
651.6
SHALLOW FLOODING
W
x 653.2
x 653.0
x 652.3
654
x 653.0
E
x 652.6
F
x 653.0
653.5
x 654.3
654
654
x 654.3
65+00
x 652.7
x 657.3
656
653
68+00
RM 4
ARCHBOLD
UPSTREAM STUDY LIMIT



13
SHALLOW FLOODING
WHITEHOUSE VILLAGE
RM3
40+00
45+00
50+00
55+00
60+00
65+00
DRIVE
OAKBROOK
LONE OAK DITCH
FLOW
DISTURBED AREA
654
656
T7N
T6N
ARCHBOLD
WHITEHOUSE
ROAD
X 652.7
X 652.9
X 651.0
X 651.4
X 652.6
X 652.2
X 651.5
X 652.8
X 653.4
X 657.3
X 657.0
657.0
X 653.0
X 653.0
657.2 X
X 657.8
X 654.3
X 652.7
X 653.2
X 657.0
X 657.2
658.3
660.2

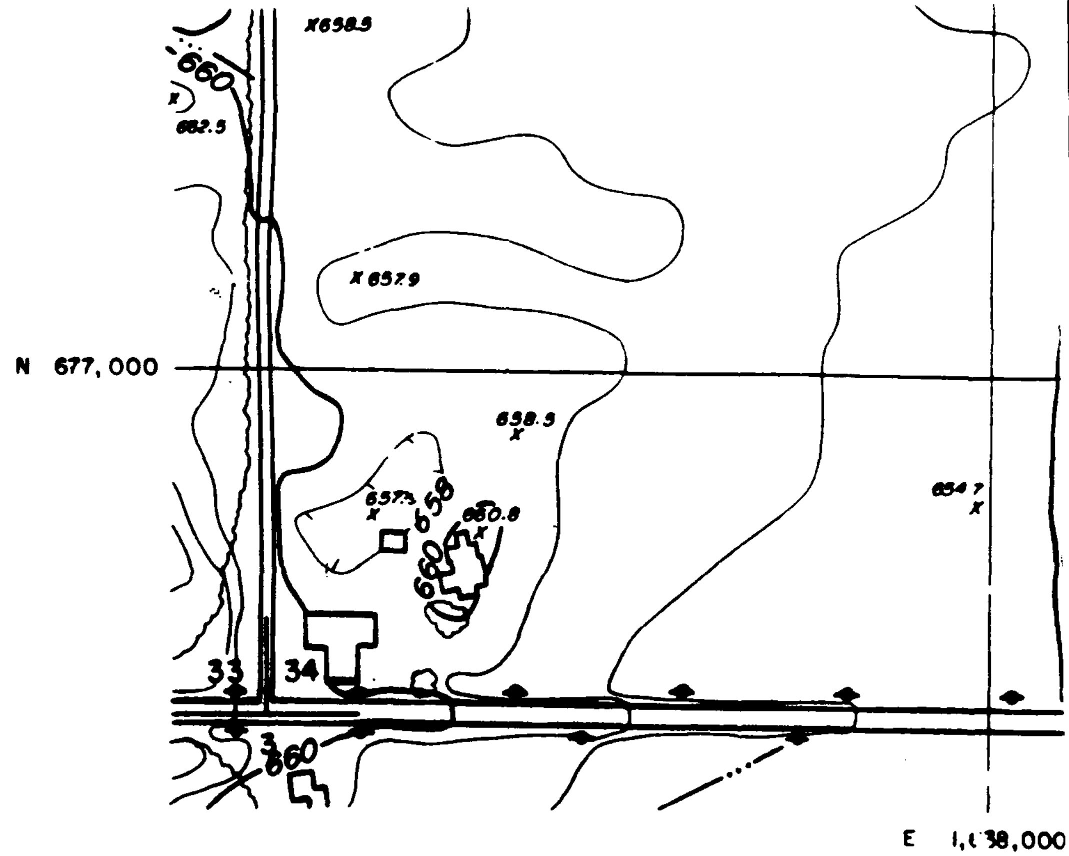

14
CENTERVILLE ROAD
RM2
RM3
30+00
35+00
40+00
TEMPERANCE STREET
LONG STREET
NORTH STREET
NORTH MERRITT STREET
GILLETT STREET
WEST STREET
SOUTH STREET
OAKBROOK DRIVE
SHEPL
WEST
POOL
NORF
W.S. 654.3
653.0
653.7
656.2
659.0
660.1
660
652.2
651.5
653.5
657.8
656.5
655.0
655.5
656.5
654.1
657.5
656.5
654.5
655.6
656.4
657.0
653.4
652.8
653.0
654.8
657.6
652.2
657.2
655.8
656.8
655.8
656.6
697.2
655.3
655.7
698.3

15



RM2
ROAD
EMPERANCE STREET
SHERMAN
STREET
SHEPLER STREET
NORTH STREET
STREET
MERRITT STREET NORTH
TEXAS STREET
WEST STREET
SOUTH STREET
POOL
NORFOLK WESTERN RAILWAY
660
654
659.3
661.9
656.5
656.2
653.5
654.1
652.2
653.0
657.9
656.4
654.5
656.6
34
35
N 678,000
N 677,000

16



LEGEND

500-YEAR F

100 -YEAR F

FLOODWAY LI

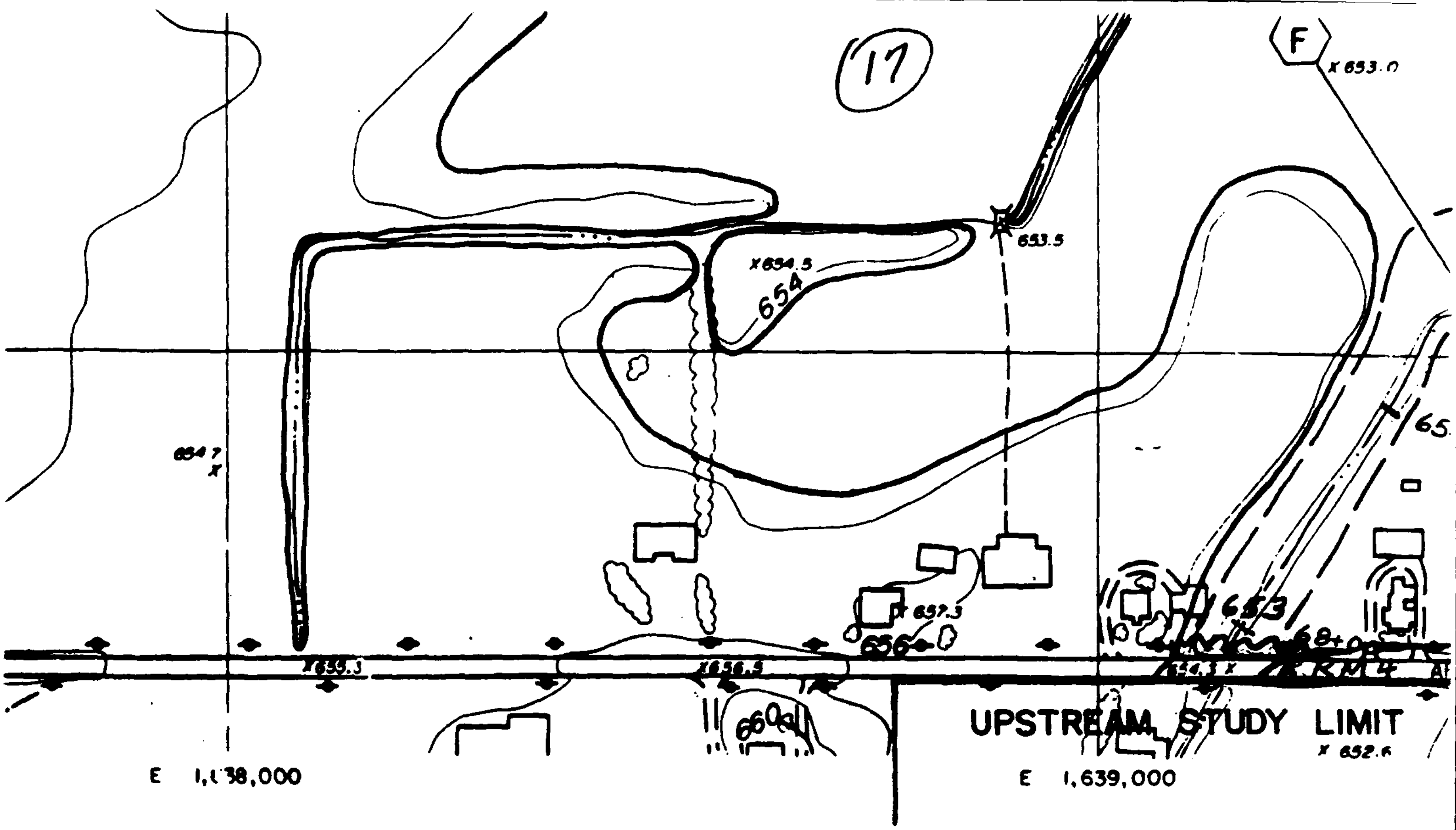
CROSS SEC

650 BASE FLOOD

RM-1 X ELEVATION

LEGEND

PAVED ROAD	SWAMP	COUNTY LINE
DIRT ROAD	DRAINAGE	CITY LIMITS
TRAIL	STREAM OR RIVER	TOWNSHIP LINE
BRIDGE	WALL	LAKE OR POND
RAILROAD	CULVERT	FENCE
GUARD RAIL	PIPELINE	CONTOURS



LEGEND

500-YEAR FLOOD PLAIN BOUNDARY

100-YEAR FLOOD PLAIN BOUNDARY

FLOODWAY LIMITS

CROSS SECTION LOCATION

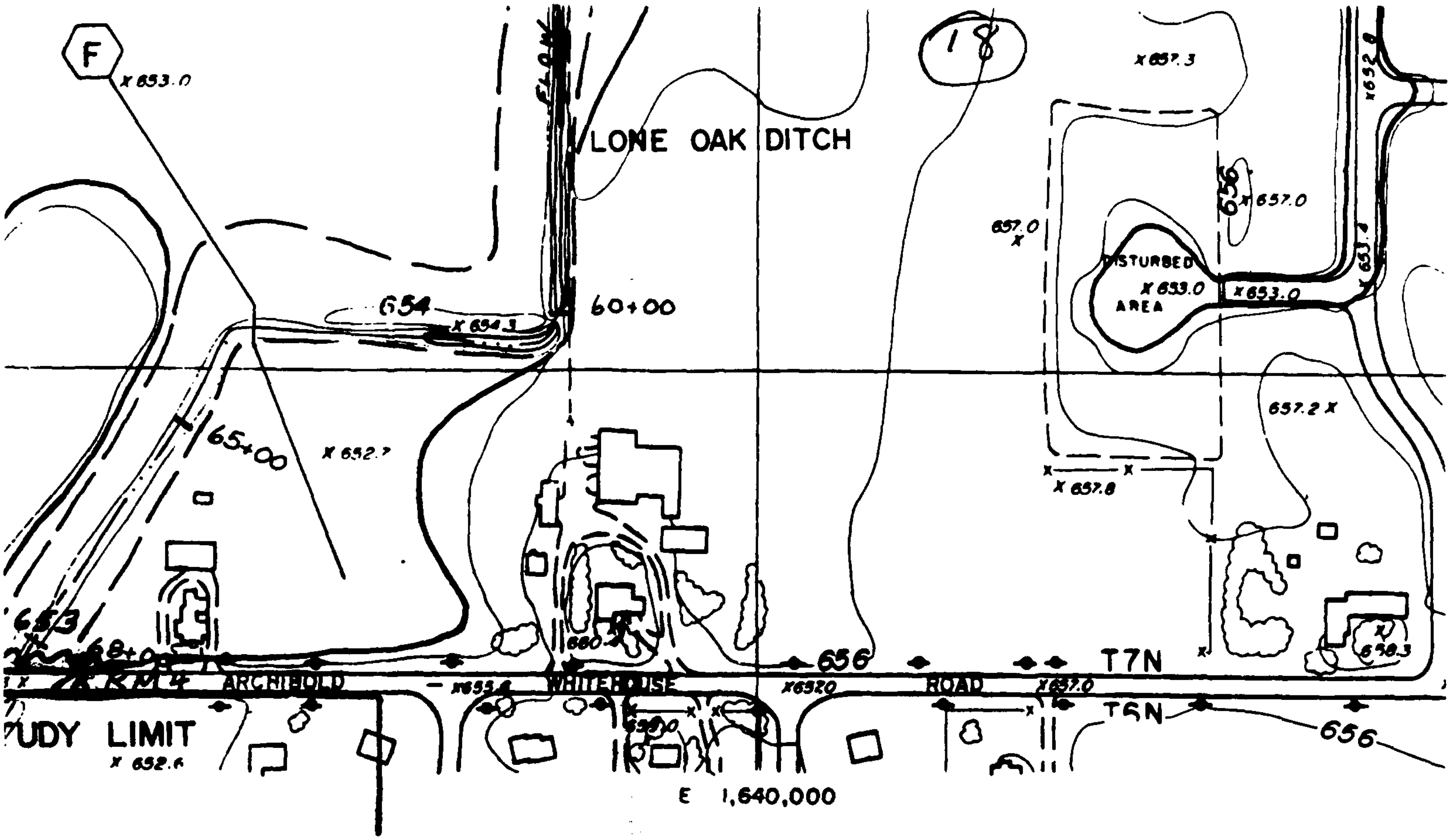
BASE FLOOD ELEVATION

X ELEVATION REFERENCE MARK

	COUNTY LINE	x 611.5	SPOT ELEVATION
	CITY LIMITS		VERTICAL CONTROL NONMONUMENTED
	TOWNSHIP LINE	△ 92	HORIZONTAL MONUMENT
	LAKE OR POND		BENCH MARK
	FENCE		SECTION CORNER
	CONTOURS		UTILITY POLE

LUCAS

Scale: 1 : 2,400



STREAM DISTANCE IS MEASURED IN FEET UPSTRE

TOPOGRAPHIC MAP

ICAS COUNTY, OHIO

Scale: 1 : 2,400 (1" = 200') Contour Interval: 2'

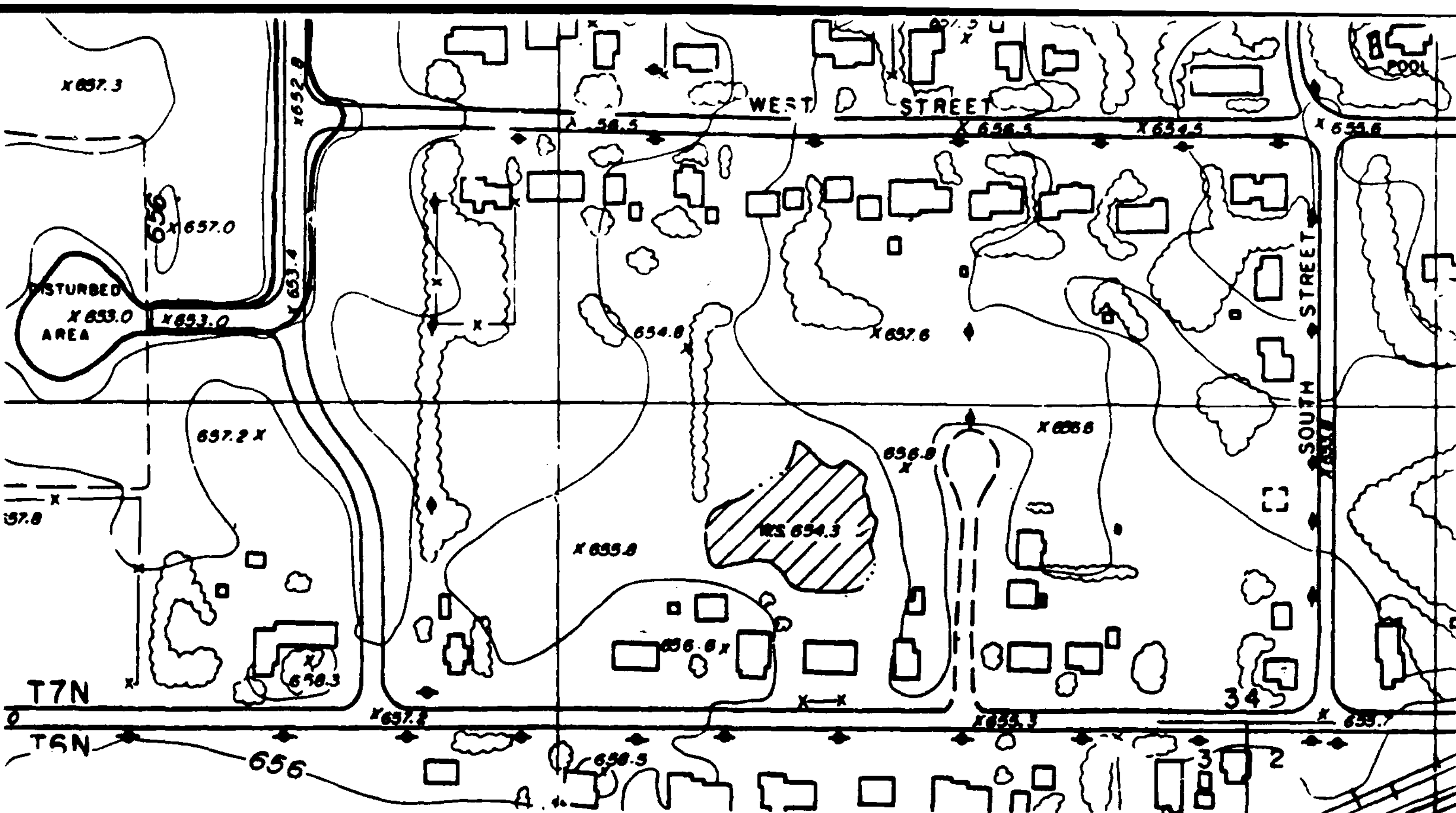
200 100 0 200 400 600 800 1000

Prepared from Aerial Photography of April, 1974

KUCERA AND ASSOCIATES, INC.

Photogrammetric Consultants

7000 Reynolds Road, Mentor, Ohio
Denver, Colorado Lakeland, Florida
Atlanta, Georgia



E 1,6-1,000 E 1,642

ASURED IN FEET UPSTREAM FROM CORPORATE LIMIT.

U.S
SPE

SHEE

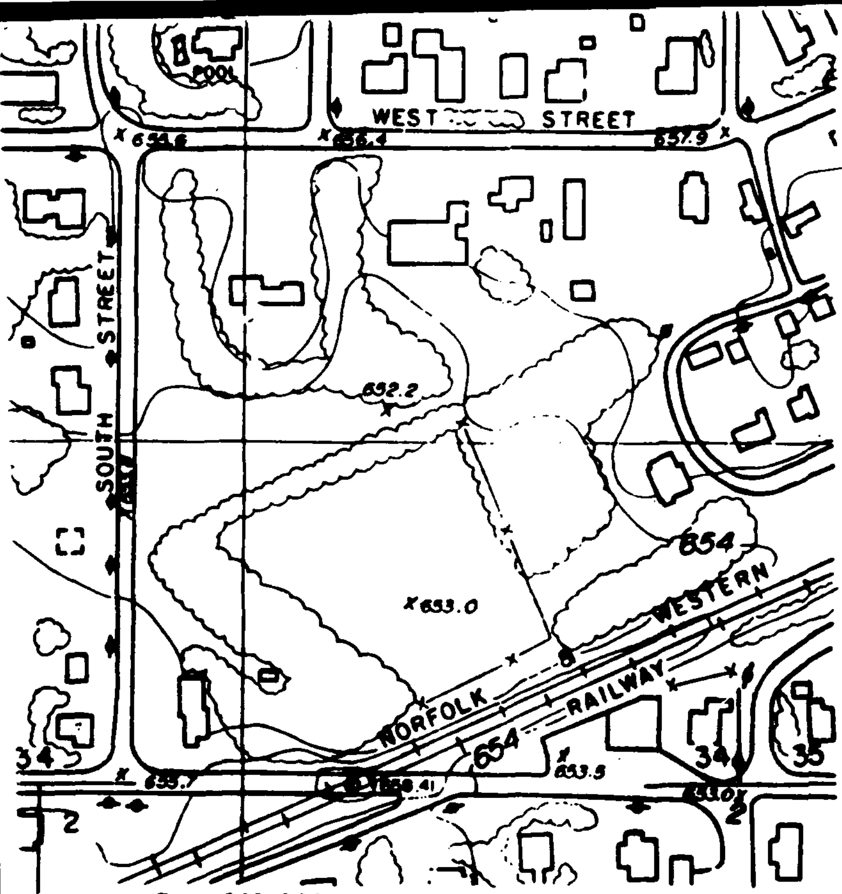
OHIO

ntour Interval 2'

GEORGE F. WILSON P.E.
LUCAS COUNTY ENGINEER

BOARD OF LUCAS COUNTY COMMISSIONE
WILLIAM K. GERNHEUSER
JAMES M. HOLZEMER
MAX C. REDDISH
1975

19



N 677,000

E 1,642,000

U.S. Army Engineer District, Buffalo
SPECIAL FLOOD HAZARD EVALUATION

FLOODED AREA MAP

LONE OAK DITCH

VILLAGE OF WHITEHOUSE, OH
(LUCAS COUNTY)

SHEET 1 OF 1 NOV. 1992

E.

IMISSIONERS

NORTH

WATERVILLE TOWNSHIP

SECTION 34

T 7 N, R 9 E

Note: 1000' grid based on Ohio State Plane Coordinate System, North Zone.
Elevation: based on U.S.G.S. datum.
Lucas County Datum = U.S.G.S. + 0.492'

(30)

~~ORIGINAL~~